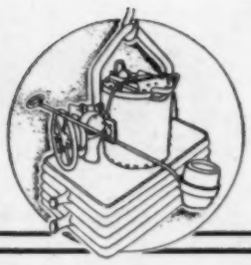

The Foundry

VOLUME 65 • NUMBER 7

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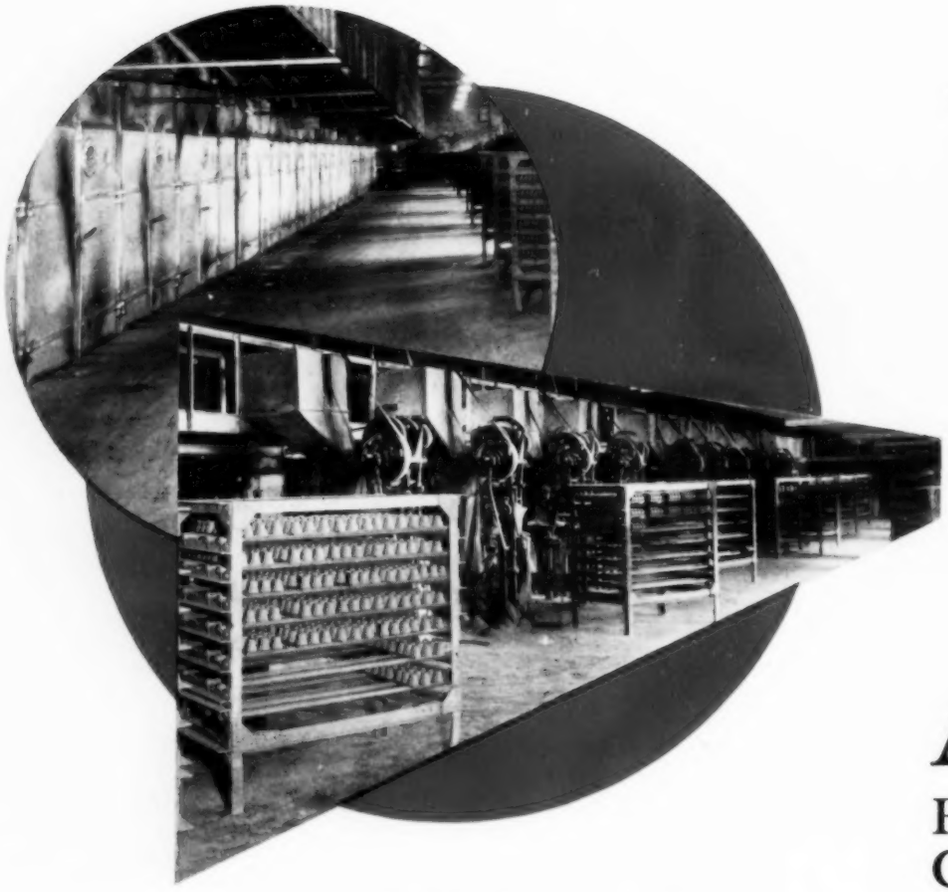
ADVERTISING PAGES REMOVED

150,000 Cores

Some Days

THE Grabler

Make 60 tons



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ASK Daniel J. has used it all Foundry Superint Company.

"Linoil runs un tant thing for us," make cores a slight We have oven con cores do not warp have slight tolera the blowers, never I regard Linoil as

Order a drum

PICTURES

Above, in circle: View of the 23 gas-fired core ovens at the Grabler plant.

Above, insert: Part of the battery of 35 core blowing machines. Each operator works two core boxes, emptying one while other is being filled.

Right hand page, top: Specimens of type of pipe fittings made in grey iron, malleable iron and brass, ranging in size from ⅛" to 10".

Right hand page, bottom: Multiple molds on pendulum conveyor. One core setter and one machine operator turn out 150 molds per hour, using 7½ tons of sand. Grabler's operate 24 of these molding machines, designed and built by themselves to meet their own requirements.

THE WERNER G.

The Foundry

Find Foundry Knowledge In All Branches

THE fact the foundry industry is divided into four rather distinct branches often appears to encourage foundrymen to neglect many avenues for the acquisition of valuable information on foundry practice. Altogether too many men holding responsible positions are interested only in those subjects pertaining to their particular branches.

This lack of interest in the progress of all phases of gray iron, steel, malleable and nonferrous practice is well illustrated in the attendance at regular meetings held by A.F.A. chapters and local foundry associations. Unless the subject to be discussed at the meeting is right up their alley, many foundrymen will not go to the trouble to attend. They forget that in a multitude of instances, practices in one branch may be applied successfully, either in their entirety or with modifications, to problems encountered in the other three branches.

Addressing the recently organized Buffalo foundrymen, Harry Dietert stressed the point of universal interest. As an example he stated both nonferrous and gray iron foundrymen should take the time to study carefully molding practices followed in the steel foundry industry. Because problems facing steel foundrymen are more difficult, due to the type of metal which must be poured into the mold, more study and research has been necessary. Due to this initial handicap, the effort expended has been greater, and as a result industry has progressed further. Gray iron and nonferrous foundrymen will find the molding practice followed in the steel industry ideally suited for casting high alloy irons and certain bronzes.

Progress in the manufacture of castings constantly is accelerating. New ideas are being tried, new practices are being developed. Literature of the industry and technical programs of foundry groups scattered throughout the country provide the vehicle for establishing better practice in each plant. Individual progress depends on a little more reading and listening.

Capacity Increases

STATISTICS compiled from the 1937-38 edition of *Penton's Foundry List*, as discussed on page 46 of this issue, present an encouraging picture of the foundry industry. While the survey reveals a slight loss in the total number of castings establishments since the previous study in 1935, certain definite trends are established.

Immediately following the World war plant capacity for producing castings was considerably in excess of normal demands. The short depression in the early Twenties left its mark, and from 1922 to 1924, the net loss was 258 foundries. The boom which followed was not sufficient to provide profits for all companies, resulting in additional declines.

The war also brought the trend toward mass production. During the past twenty years this trend has progressed wherever possible, so that today there are more large production foundries in the United States than ever before and the tendency continues.

The slight yearly loss shown in the 1937 survey is less than half that reported in any other 12 months during the boom and depression periods. In the face of trends toward larger units equipped for mass production, and when it is remembered the depression still lingered during the first portion of the period covered by the recent survey, it seems quite evident the industry is becoming stabilized numerically, and that another two years may witness an increase in the number of plants.

Experience since the first of this year shows clearly that the foundry industry does not possess capacity in excess of normal demand. Any increase in business over that of the Spring of 1937 will require more capacity. Even now the trend is in that direction.

Frank G. Steinebach
Editor

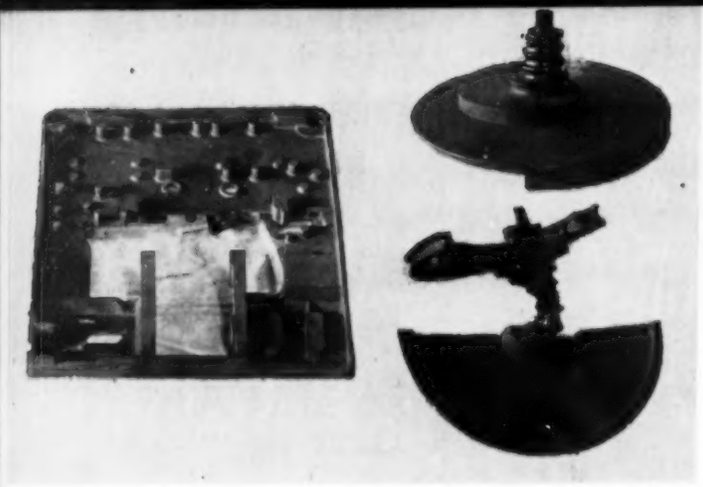


Fig. 1 (Left)—The casting must be perfectly straight and flat. Right—Pattern for spiral drum molded and cast in green sand in 3-part flask

Make Large And

By
PAT DWYER

IN THE early days of the foundry industry the proprietor of a gray iron foundry was prepared to accept orders for any type of casting, large or small. No limit on the smaller sizes and the only limit on the larger sizes was the melting capacity of the cupola and the lifting capacity of the crane. Even under these handicaps, old time foundrymen produced some remarkably large castings, displaying those traits of ingenuity and resourcefulness that have characterized members of the craft from the earliest day down to the present.

When the ladle equipment was not sufficient they built temporary reservoirs to collect the required amount of metal. When the cranes were inadequate they utilized gin poles, levers, jack-screws and rollers in handling the castings. Cast iron columns 51 feet in length were made by Jim Floyd in New York in 1880 for the trestle supporting the Ninth avenue elevated railroad at the high turn above 110th street.

A year before that, in 1879, the Sessions foundry was established in Bristol, Conn., and it has been in continuous operation down to the present in the hands of three successive generations of the Sessions family. The original small foundry has been re-built and extended on many occasions until now with five cupolas, it is one of the largest if not actually the largest gray iron foundry in the state of Connecticut. This foundry also enjoys another peculiar distinction in that it produces probably a wider range of castings, more individual items than any other in the New England territory, a territory famous for the range and diversity of its products. Castings range from almost microscopic spool chaplets ⅛-inch thick and ¼-inch in diameter, to massive anvil blocks weighing 35 tons.

Despite the constant weeding out of obsolete patterns, and the removal to customers' premises of patterns after they have served their purpose, the pattern storage building through association of ideas, brings to mind the mental turmoil of the little old lady in the nursery story, the little old lady who lived in a shoe and who had so many children she did not know what to do. A tour through this pattern storage—if that were possible—would go a long way toward convincing the late Messrs. Anderson and Grimm that they

Fig. 2—Anvil bases in wide variety of sizes and styles for power driven hammers are molded in dry sand. Trunnions are cast on the sides to facilitate handling

d Small Castings

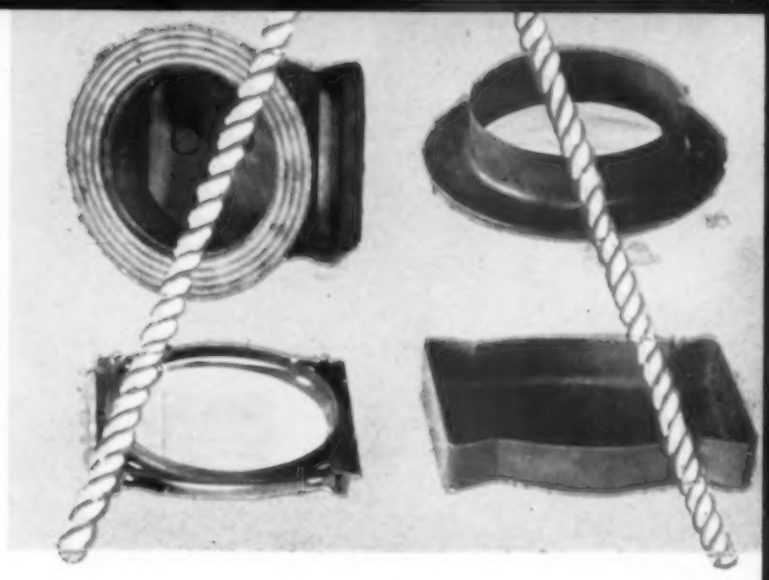


Fig. 3—The tricky casting, upper left, is molded in green sand from the pattern shown in three parts

really and positively had not seen anything yet!

Large wood patterns are stored in a 5-story, reinforced concrete, fireproof building served by an elevator. The majority of these patterns are in the *live* class, either awaiting their turn to go into the foundry, or, stored temporarily after fulfilling their purpose before they are shipped to the various customers. Floors and subdivisions of the floors are numbered to correspond with a card index in the office which indicates the location of a pattern at any given time.

Patterns Are Card Indexed

While these patterns present almost infinite variety, their classification is relatively simple when compared to kaleidoscopic distribution of small patterns, whether loose and individual, or mounted on matchplates on the ground floor in another section of the building. Steel racks divided by narrow aisles extend from side to side of the building and the patterns are stored on the shelves in accordance with a system which enables any person who needs a pattern to locate it instantly and accurately. Many of these patterns are in fairly constant use. Others are seasonal and only are pressed into service at certain periods. A certain number are venerable relics, souvenirs of customs, habits, styles and practices highly popular at one time, but long since relegated to the limbo of forgotten things. Occasionally out of the mist of years a customer bobs up with a request for a casting that went out with the dolman, copper toed boots, horse cars and kerosene lamps. The pattern is picked from its cobwebbed nest, sent to the foundry and possibly may be placed in the hands of the molder who made the first casting. Employes of the Sessions Foundry are not transients!

The company rather prides itself on the long term service of many of its employes and incidentally regards the factor as an asset. Majority of the castings, particularly the light castings made in the green sand section of the foundry, not only require a high degree of deftness and manual dexterity, but in addition involve the possession of intuition or a sixth sense only acquired through long experience on the part of the molder. In this connection it is interesting to note that each molder cuts over his own sand heap and decides upon any necessary additions including the proper moisture content. In a typical day's run it is not unusual to find as high as 25 different sand mixtures in use on the various floors. In many instances the difference is

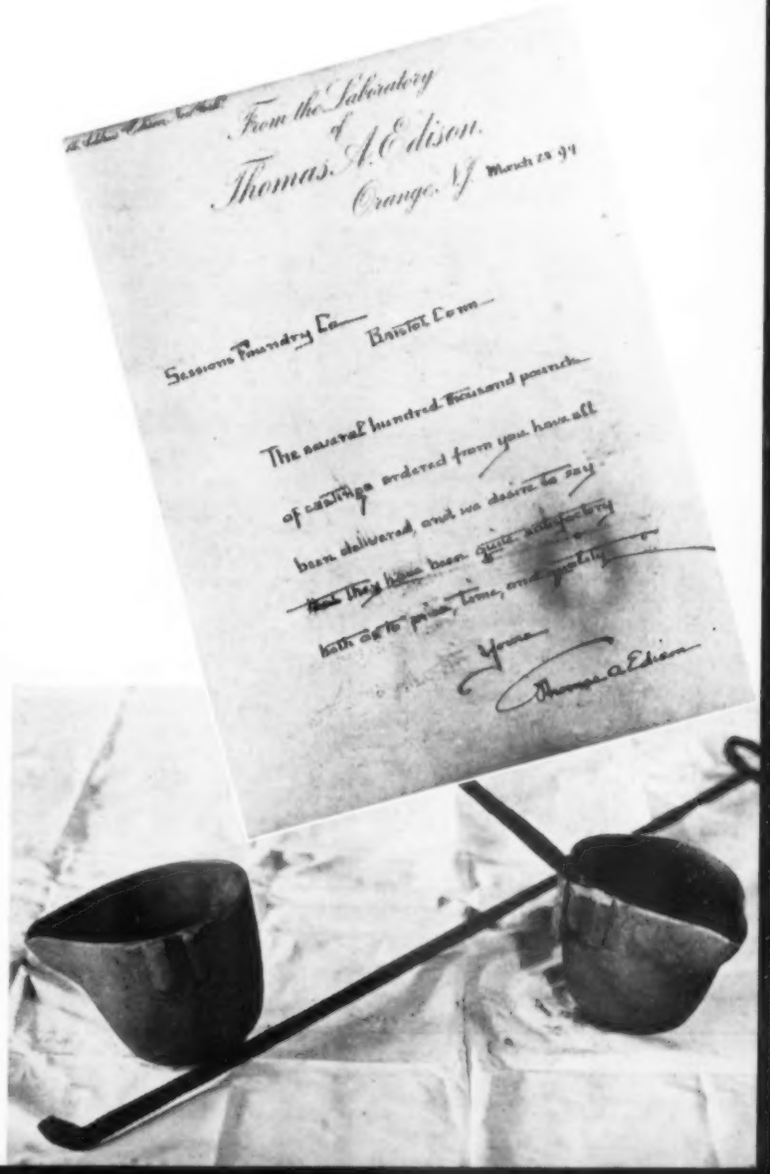
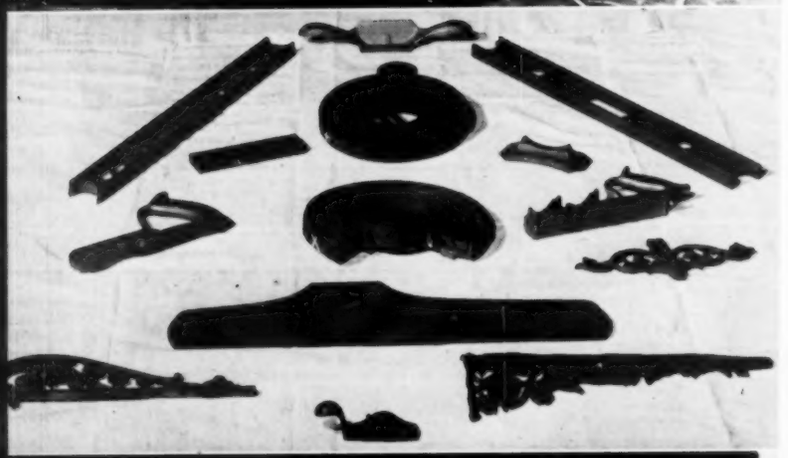


Fig. 4 (Above)—Note from laboratory of Thomas A. Edison dated March 28, 1894. Fig. 5 (Below)—Shanks for the cast iron hand ladles fit into dovetail slots at the side and may be either right or left hand



only slight and may affect only one of the main constituents, bond, permeability, grain size, or moisture content. In other instances the difference may be quite marked in one, two, three or all four features. Texture and composition of the molding sand are recognized as extremely important factors and are decided in the foundry laboratory before any given casting is placed in production. All the castings must pass a rigid inspection test in which surface appearance is one of the major factors.

Groups of typical small castings shown in the accompanying illustrations reflect the high degree of technical skill and practical foundry knowledge required in their production. Allowable tolerances in size, shape and dimensions practically are negligible. In some instances the weight specification is so close that a variation of a few grains plus or minus, is sufficient to condemn an otherwise perfect casting. Absolute straightness is a primary requisite in some castings, while in other comparatively large, thin, flat back castings with ribs and projections on one side, the flat back must lie on a surface plate as closely and accurately as if machined. Except in special instances all the castings are made from a readily machinable iron with a silicon content of approximately 2.50 per cent. Exceptions include castings subject to severe wear or abrasion, corrosion or extreme thermal conditions. Suitable alloy materials are added to the iron poured into these castings.

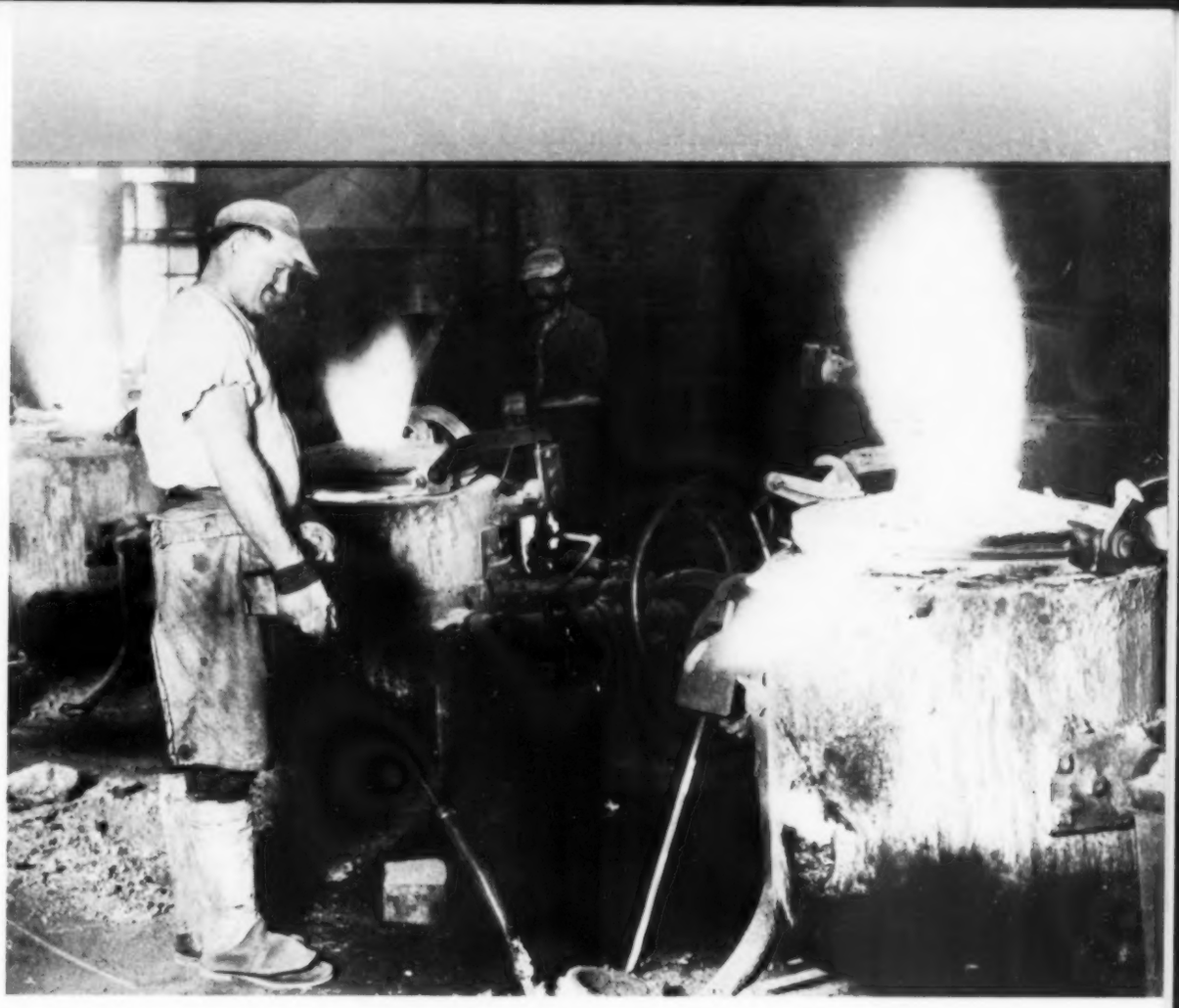
Castings in Wide Variety

Castings shown in Fig. 8 include ornamental curtain supports, oil burners, a clock base and wood working tools. The tool castings are made to the order of a prominent New England manufacturer of that type of equipment and under normal operating conditions are supplied to the extent of a car load per week. The oil burner casting made up of a circular base and a number of concentric rings with deep grooves between, is molded in a dry sand core. The burners are cast in pairs as shown in Fig. 10.

Another typical group of castings in which dry sand cores to some extent are incorporated in the green sand mold, is shown in Fig. 6. Clean, true and accurately spaced gear teeth on the two large ring castings shown near the bottom of the illustration, are secured by the use of fine oil sand cores. The stoker casting at the upper left, pierced with 648 holes is made in a green sand mold, but the drag part of the mold merely serves as a print or receptacle for a dry sand core made in sections and pasted. One of the sections is shown in the upper center, Fig. 10. Manifestly nice manipulation with core sand mixtures, corebox and coremaking equipment is required in making these cores with every little tapered cone intact on the sloping surface. Further illustration of tricky application of dry sand cores in green sand molds is shown in Fig. 12.

Pattern at the left in Fig. 1 is for a grooved drum. In the center the pattern is shown with the halves separated. With the exception of the center core the entire mold for this casting is made (*Please turn to page* 62)

Reading down. Fig. 6—Intricate castings molded partly in green sand and partly in cores. Fig. 7—Cast iron drums with pipe spokes, 8 feet diameter, 5-foot face. Fig. 8—Miscellaneous light gray iron castings, ornamental, oil burner, clock base and hardware tools. Fig. 9—Small hammer blocks or bases, weight of each 19,000 pounds



Nonferrous Melting Requires Excellent Furnace Operation

By N. K. B. PATCH

SINCE melting metals in the nonferrous foundry is one of the vital steps in maintenance of quality, and since operation and care of melting equipment are so vital to the quality of the metal poured in castings, some thoughts on the subject of operation and maintenance of furnaces in the nonferrous foundry seem important.

The first requisite for successful operation of the crucible type of pit furnace fired with coke or coal is maintenance of adequate draft and avoidance of clogging of grates so that a satisfactory supply of necessary air is available at all times for rapid combustion of the fuel.

Maintenance of the furnace lining obviously is an important factor, not only since it influences the successful operation of the furnace from the standpoint of the production of high quality metal, but also since a lining, which has been badly scored or melted away, means a waste of fuel in many instances.

It might be well to point out that the lining in this type of furnace will last much longer if bricks are set as closely together as possible, and the amount of mortar between them is at the absolute minimum. Where forced draft is available for this type of furnace, equipment for providing this draft should be maintained carefully to insure a uniform pressure and volume under like conditions, and a minimum resistance to flow of air so that maximum efficiency may be assured at all times.

In the case of a furnace in which the metal is contained in a crucible and the source of heat energy is from the combustion of gas or oil, the lining should be maintained most carefully and the orifice through which burned gases enter the furnace cavity should be watched carefully to see that the size and shape are in accordance with the original design so that the resistance to flow will be at a minimum and the flame at all times is held in the desired direction.

One interesting factor with this type of furnace is the slagging action of some flames on certain types of refractories. This causes melting of the refractory lining, which, upon running down to the bottom of the furnace, sometimes fills up the orifice or changes the direction of the flow of the burning gases so as to change materially the combustion conditions, and consequently, melting conditions.

Clearance around the crucible for passage of burning gases is an important factor in the operation of

this type of furnace. Consequently, the change in size of crucible in a given furnace will change the clearance and result in a material change in furnace conditions. The ideal would be to have a different size furnace for each different size crucible, thus maintaining the ideal clearance between crucible and furnace lining. That obviously is not commercially practical, but different size furnaces can be maintained in which two or three different size crucibles could be used conveniently and the fuel economy might be within reason under such circumstances.

Melters Hold Different Opinion

Directional flow of gases around the crucible is a subject for debate among furnace designers and furnace operators. There are those who maintain that damaged crucibles result from having the flame gyrate around and around the crucible. They claim that the flame should flow in irregular directions and possibly enter the furnace through several orifices. To have the flame impinge directly on the graphite crucible is obviously bad practice if an ample supply of air is available for the combustion of the fuel.

This superheated air oxidizes some of the graphite in the crucible and will finally result in the chewing away of a local spot where the flame impinges. Therefore, a block upon which the crucible may rest should be provided upon which the flame may impinge. That block usually is made of a refractory of similar material to that in the furnace lining. Where a variety of sizes of crucibles is used in the same furnace and they all stand on the same block, it will be found desirable to have some way of adjusting the position of the burner with relation to this block to secure maximum efficiency in terms of minimum fuel consumption per pounds of metal melted.

The outlet through which the gases leave the furnace is an important factor in the control of this type of furnace, in that a certain resistance to the flow of the gases through the furnace tends to increase the time during which heat transference can occur from the flame to the metal. Obviously, the resistance cannot be such as to cause backfire or to retard the flow of burning gases entering the furnace.

In lining this type of furnace, the choice of materials is an important factor and will be influenced materially by the location of the foundry since refractories are heavy and bulky, and transportation charges consequently high. The refractory that is most economical for a given foundry may be that which is nearest to the location of the plant, provided it has sufficient lasting power to compare favorably with something which might cost considerably more for delivery charges.

In cementing the bricks of the lining it always is wise to use a cement that is recommended by the manufacturers of the brick. In many instances it is a fire clay produced from the same clay that has been used in the manufacture of the brick. Thus any chemical action that would cause fluxing of the brick at elevated temperatures by the presence of the wrong kind of clay is avoided. As is true in the installation of all fire brick, the cement layer between the brick should be the absolute minimum. In other words, the bricks should be as closely in contact with one another as possible.

Sudden chilling or sudden changes in temperature are disastrous to good furnace linings. Consequently, care should be taken that cold drafts do not reach a furnace which just has been heated up to operating temperatures. In the course of operating these furnaces, it will be found desirable to clean them out regularly every night so that at the beginning of each day's melting period the furnaces are in first class order, clean and smooth and in every way prepared to do efficient, effective and rapid melting.

Adequate Supply of Air Needed

It generally is conceded by those who have studied the combustion problem for this type of furnace that an adequate supply of air at low velocity is to be preferred to the supply of the same amount of air at a higher velocity. The burner design, of course, controls this to some extent, but the shape and size and number of bends and curves in the pipe lines also affect this condition, and should be studied with care. A certain amount of air commonly is induced by the jet of the burner in the furnace orifice.

This provides a supply of air for combustion that is in excess of that delivered by the fan or blower; but since the shape of the orifice and the position of the burner affect the amount of air thus induced, care should be taken to see that the proper amount of air is supplied for the complete combustion of the fuel, either from the source of the blower or from this induced air or the combination of the two.

Complete combustion of the fuel is highly essential if satisfactory metal is to be secured day in and day out, and this complete combustion must be assured uniformly for day in and day out satisfaction. Underburnt gases are the ones absorbed by the melting metal and result in the gassing of otherwise highly satisfactory melts.

In the case of the barrel type or reverberatory furnace having the burner located in the ends at the axis of the barrel, the question of proper lining is especially important. This is true since the metal itself is in contact with the lining during its entire stay in the furnace, and chemical action between the metallic oxides and the materials in the furnace lining produce slags. Such slags may destroy the lining rapidly and may in (*Please turn to page* 66)

Shop Training Promotes Understanding

By R. C. HARRELL

Superintendent Gray Iron Foundry,
Stockham Pipe Fittings Co.,
Birmingham, Ala.

Fig. 1—Apprentice patternmaker learning to varnish patterns

FIELD of industry today has become a battleground with labor and management in opposing trenches. Shortage of skilled manpower has prompted labor to seek all the advantages in their particular trades. Management prepared or unprepared is trying its level best to still the troubled waters on which the house of industry is floating.

Both parties are responsible for the present unrest. The worker has become dissatisfied with the advent of the new social order of the nation. Industry, with the tide of recovery slowly creeping in, has found itself in an embarrassing position, due to a lack of sound industrial educational program. This holds true in all productive industry, regardless of location or size.

Industry cannot evade a certain responsibility to the young men who have been employed under the old methods of selection. Majority of men employed in industry today have been chosen because they passed a certain physical examination, without regard to their mental characteristics or vocational training. The term vocational applies to all gainful occupations.

The writer believes that if a program of mutual giving and receiving of vocational guidance and training had been enforced during the past few years, the present unrest would be unknown and a happy state of confidence and satisfaction would be on the horizon of business.

To prevent a repetition of this unhappy condition in the future, management should look at its present and future personnel and take steps to encourage and give counsel to youth during the training period.

When a young man begins to think of a career there are three paths that he may choose: (1) He may finish his schooling through a university and go into some profession. (2) He may finish high school and enter the business field. (3) He may attend neither, through lack of opportunity or lack of initiative, and is driven by necessity to take what comes, or is tossed from place to place until he settles in some occupation for which he is unsuited. A study of the life of the boy who comes under the last heading would show many places where progress was blocked only by ignorance and indifference.

Fig. 2—Vocational class on annual tour visiting the Tennessee Valley project

More satisfactory progress is possible to the person who will endure a fraction of the discomfort suffered during a life time in a hated occupation. The youth thrust into an immediate job has a problem confronting him. He must move forward, or stagnate with the other millions and satisfy himself with a life sentence of hard labor and dissatisfaction. If the youth wishes to rise in the world, he must submit himself to rigid training for the jobs that constitute the rungs of the ladder of success.

First, he must choose the type of job he wishes to follow for a life vocation. In the wise choice of a vocation there are three broad factors: 1. A clear understanding of himself and his ability. 2. A knowledge of the requirements, compensations and opportunities in different lines of work. 3. Every young person needs help on these points. He needs counsel. He needs vocational counsel. He needs careful and systematic help by experienced minds in making one of the greatest decisions in his life.

If already employed, he may use his present job as a stepping stone to a higher one. Every job should be a station on the road of life, not a terminus. Other things being equal, a job is desirable according to the number of roads leading from it to better jobs.

For- (*Please turn to page* 71)

J. H. Pohlman

W. Seelbach

Peter Rentschler

R. E. Kucher

Gray Iron Founders Society Holds Annual Meeting

SPEAKING before the annual meeting of the Gray Iron Founders' society in Cleveland on Friday, June 11, Whiting Williams, Cleveland, stressed the belief that agreements made recently by numerous industries with the unions are being taken more seriously by industrialists and the general public than the facts of the case warrant. Mr. Williams has divided industrial workers into three groups as follows: First, 20 per cent who are pro-union, made up of young men of relatively short service who are inclined to be radical; second, 20 per cent consisting chiefly of older men long in service who are procompany; and third, 60 per cent who are neither prounion or procompany but pro-job.

The latter group is interested in determining which of the two courses will permit each individual to realize his ambitions of maximum satisfaction on the daily job. The 60 per cent group is a shiftable and changeable power moving one way or another as the comparative values change. Undoubtedly the 60 per cent group will have a more reasonable point of view with regard to the entire situation.

Mr. Williams believes that many employers have become confused regarding the actual issues involved in the labor-management controversy. These men feel that the gulf between employers and employes provides an impossible situation. However, experience has shown that the gulf is not as impossible as it seems and that most of the issues which confront labor and management are individual in nature and small in magnitude.

Three emotions are to be found in the minds of the workers. These are, fear—mostly in the loss of a job; hope—which causes men to want to climb from one strata to a higher position; and pride of the job—which comes to the skilled man. Mr. Williams believes that the CIO is a hard-times union equipped only to give one service, that of relieving fear on the loss of a job. He feels that that union will have a hard time in overcoming the centrifugal force which separates the skilled and unskilled mechanic in good times.

Open New Fields for Castings

In an address, "Publicity for Sales Promotion to Increase the Use and Sale of Gray Iron Castings," L. J. Wischerath, advertising manager, Buffalo Foundry & Machine Co., Buffalo, stated that only when a foundry or group of foundries develops new fields of service will the demand for gray iron castings increase. Foundrymen should acquaint prospective users with the properties available in gray cast iron today, in contrast with the properties discussed in some text books on engineering materials.

Mr. Wischerath showed through slides the extent to which competition has gone in misrepresenting gray iron. He also discussed the recent advertising program of gray cast iron conducted by the Gray Iron Founders' society and expressed the opinion that a continuance of this program will bring highly satisfactory results. An advertising campaign such as that of the society is designed to appeal to reason, and therefore takes longer to provide results. Two important new factors vitally affect the depreciation problem, according to Prof. P. T. Norton, Jr., Virginia Polytechnic institute, who spoke on "Rethinking Depreciation and Obsoles- (*Please turn to page* 74)

Prevention of Silicosis Through Engineering Control

IT GENERALLY is agreed that in the control of exposure to dust, primary consideration should be given to procedures for preventing contamination of the air of the breathing zone to a harmful degree. However, there always will be situations where these procedures will be inapplicable, impractical or not adequately effective. For these situations, respirators will be required to give protection, either as a primary means or as an adjunct to other dust-prevention procedures. In addition to situations for which respirators offer the most suitable means of protection, there are at the present time many uncontrolled exposures where respirators should be used until other dust-prevention measures are developed and installed.

Respirators are an immediately available means for dealing with a dust hazard; they are broad in their scope of application; and where other dust-prevention procedures are inapplicable or inadequate, they are the last line of protection from dust.

All devices for personal respiratory protection are included in this report. To promote more uniformity in the naming of the various devices and to provide a basis for a clearer understanding of these devices, a standard nomenclature scheme has been suggested and is listed briefly in the report. The three general classifications are:

1. Supplied-Air respirators
2. Supplied-oxygen respirators
3. Air-purifying respirators

These respiratory protectors include two general fields of use, namely: devices for emergency situations and devices for more or less normal situations that are not immediately harmful. From a practical viewpoint, the important requisites of a device to meet the emergency situations are complete and positive respiratory protection; and for the latter situation, adequate protection with a minimum of inconvenience and a maximum of comfort. This latter is the field of protection involved in the prevention of silicosis.

Of the air-purifying class, the type most commonly used is the mechanical filter respirator for mechanically-generated dust. These respirators give no protection from gases and vapors contaminating the atmosphere.

The general requirements of a safe and suitable mechanical filter respirator are (1) adequate protection, (2) reasonable comfort and convenience, (3) an acceptable service life period of protection, (4) easy cleaning and sterilization, and (5) low cost of maintenance in good serviceable condition.

A discussion is given in this report of the filtering principles of dust removal by mechanical filters and of the errors in designating efficiency of protection of mechanical filters. It is concluded that the fundamental basis for judging the suitability of a respirator is whether or not the amount of dust that is unretained or escapes through the filter under conditions of practical use is below the amount that would be harmful to breathe. This is not related to any percentage efficiency.

Of the class designated as supplied air respirators, the types are those commonly known as hose masks, air-line respirators, and abrasive blasting respirators (sand-blast masks, helmets, and hoods).

The air-line respirator consists of a tight fitting facepiece, a loosely fitting facepiece, or even a helmet or hood covering the head and extending down over the neck or shoulders. The air supplied to these respirators has been largely that obtained from the compressed air source used in the performance of the work, as in sandblasting, pneumatic drilling and spray painting. This air frequently is contaminated with objectionable and, in some instances, harmful substances which, to some extent, can be removed by air-purifying appurtenances. Pressure-reducing valves or releases largely eliminate the dangers from high air pressures. More recently, blowers or pumps (usually (*Please turn to page* 72)

Engineering

OF the four reports presented at the Second National Silicosis conference, held early this year in Washington at the Call of Secretary of Labor Frances Perkins, the engineering aspects probably are of greatest immediate interest to the foundry industry. This and the article which appeared in the June issue have been taken from the summary of the extended report of the Engineering committee.

The committee on engineering control is composed of the following: Warren A. Cook, Chairman; Cyril Ainsworth; James R. Allan; J. J. Bloomfield; Thomas J. Donnelly; Philip Drinker; C. H. Fry; Dr. Leonard Greenburg; Daniel Harrington; Willis G. Hazard; E. O. Jones; Dr. E. G. Meiter; and William P. Yant.

Progress Made in Cast Irons

By HAROLD S. AUSTIN

Foundry Metallurgist
Buick Motor Division, General Motors Corp.,
Flint, Mich.

This is the concluding article of a series of two abstracted from a paper presented recently at the Saginaw Valley Group meeting of the American Society for Metals. The first article appeared in the June issue.

THE composite centrifugal brake drum presents an interesting example where the merits of steel and cast iron are combined to give a strong, durable casting of excellent wearing qualities. One of the features of this operation is that it falls under the permanent mold process in which the mold is an integral part of the casting. In this process, a steel stamping, which is the mold and ultimately becomes the outer rim of the drum, is heated by electrical induction to a temperature of approximately 1600 degrees Fahr., and quickly placed in chucks of a centrifugal machine and rotation started. In the meantime a weighed amount of duplexed electric furnace iron is poured into an attached runner basin, and the molten iron introduced into the red-hot revolving steel stamping.

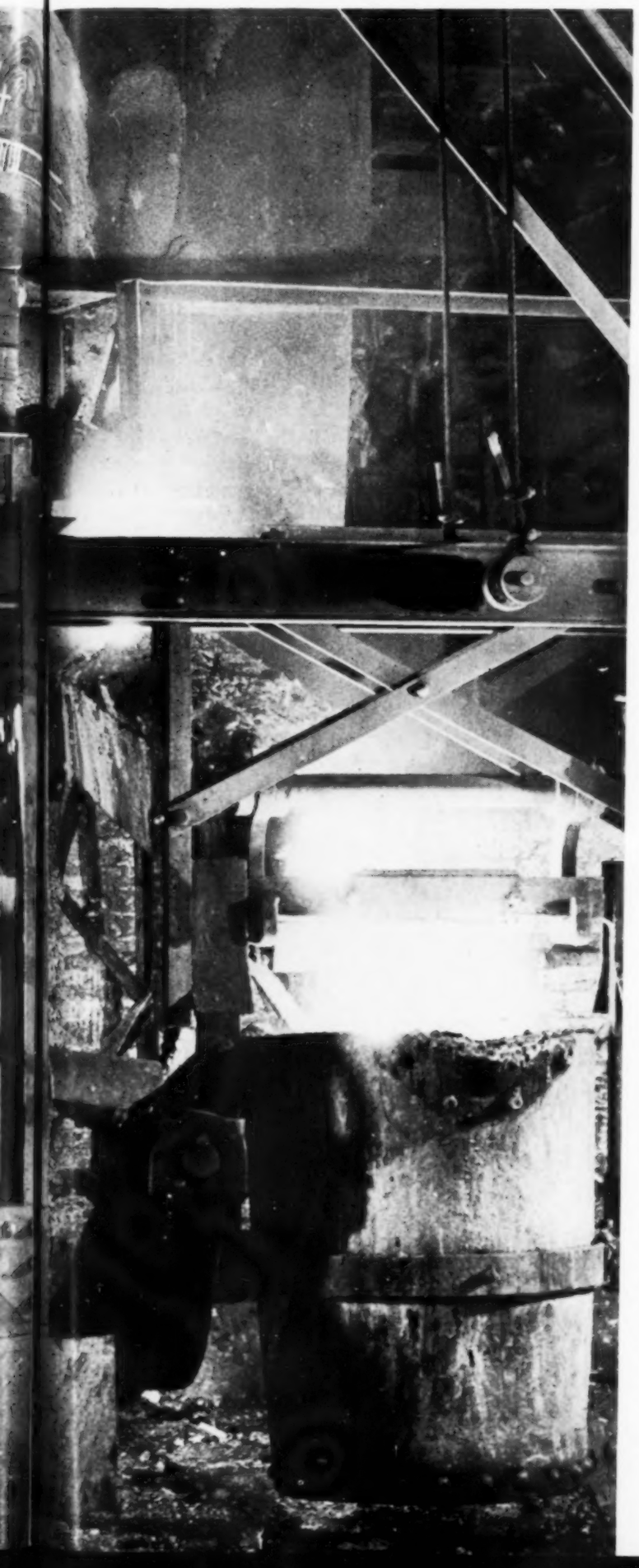
Unite Cast Iron and Steel

A perfect fusion is formed between the steel and iron surfaces. The result is a drum with a strong reinforced backing of mild steel combined with a rigid, excellent braking surface of cast iron. An examination of the zone of fusion between the steel and iron by means of the microscope reveals a deep penetration of carbon from the cast iron into the steel. The structural formation is that of lamellar pearlite.

Composition of iron found to be most suitable from the standpoint of machinability and wear, and which was adopted for this drum, was a high carbon, moderately low silicon iron containing: Carbon, 3.60 to 3.70 per cent; silicon, 1.90 to 2.00 per cent; chromium, 0.15 to 0.25 per cent. The fracture of the iron is gray and extremely fine. The structure is lamellar pearlite. An interesting feature of this operation is the formation of slag on the inner surface of the iron during the spinning and solidification of the iron. An analysis of this slag revealed the presence of a large amount of sulphur and manganese forced from the iron by centrifugal action.

Quite a variety of iron compositions are used in cylinder liners, although the majority are similar to cylinder iron but usually of a harder composition, with somewhat lower carbon and silicon. The following composition is fairly representative: Total car-

For Automotive Applications



bon, 3.10 to 3.25 per cent; silicon, 2.00 to 2.20 per cent; manganese, 0.60 to 0.80 per cent; phosphorus, 0.25 per cent maximum; sulphur, 0.12 per cent maximum; nickel, 0.50 to 1.50 per cent; chromium, 0.30 to 1.00 per cent; molybdenum, 0.40 to 0.70 per cent. Special compositions also are used as mentioned under the subject of heat and growth resistance compositions where extremely severe conditions are encountered.

Heat treated cylinder liners are in high favor and have the advantage of greater hardness over the *as cast* liner. The liner to be heat treated is annealed, which makes it readily machinable; it is again heated to 1500 degrees Fahr. or higher in a neutral atmosphere after machining and quenched; following this, it is tempered at a temperature of from 400 to 700 degrees Fahr. depending on the hardness desired, and ground to finishing size.

This process also is probably the best for removing all internal strains. The symmetrical shape of cylinder liners lends itself admirably to centrifugal casting. Large numbers are being produced in this manner, in sand and in permanent molds. It usually is necessary to anneal liners cast by the permanent mold process.

Liners Must Be Heat Treated

Nitrided liners are being produced. The base iron is similar to that used in other sleeves. The composition, however, includes the alloying metals aluminum, chromium and molybendum in amounts of about 1.00 per cent each. Vanadium also is used for this purpose. The liners must be heat treated and machined before nitriding. They are ground to finishing size as a final operation.

As a general rule, pistons are produced from cylinder iron. Pistons which are subject to heavier duty and to more severe heat conditions sometimes are made from heat resisting irons. Quick anneal, high silicon-carbon or graphitic steel pistons also are being produced with considerable success. The great strength and toughness of this metal in annealed castings, permits machining to such thin sections that they are comparable with aluminum pistons in weight, with the advantage of a much smaller coefficient of expansion.

Valve seats, especially those used on trucks and busses, often are subjected to exceptionally severe heat conditions. Valve seat inserts have been devised of special compositions to withstand the severe service requirements. Several compositions of metals such as stellite, high speed steel and alloyed cast iron have been used with success. Cast iron inserts may be made of cylinder iron with addition of about 1½ per cent of chromium; molybdenum is also used in varying amounts from 0.5 to 5 per cent. Many of the other compositions of high alloyed iron should be suitable for this purpose also.

Fig. 5 (Preceding Page)—Metal from the cupola is tapped into transfer ladles carried on a monorail system. Fig. 6 (Left)—Charging the cupola with coke

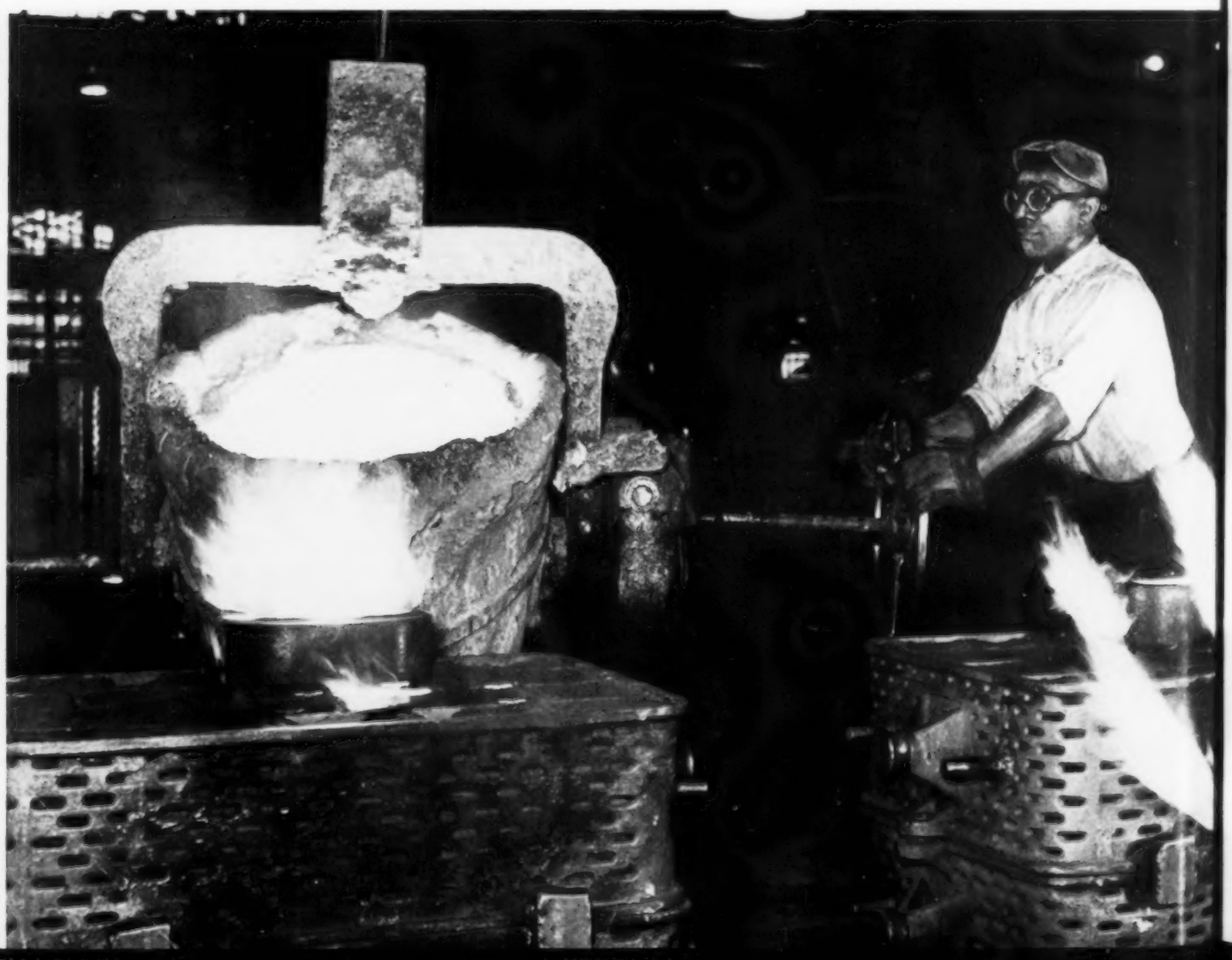
Foundry practice employed is similar to that in the molding of piston rings. The use of permanent molds is also an ideal set-up for the production of valve seat inserts. The iron is white in fracture with a hardness of more than 500 brinell. The use of alloys is to prevent cracking, growth and softening. Molybdenum is especially valuable in valve seat inserts on account of its strengthening effects at high temperatures. The inserts must be ground as they are too hard to machine.

Reference has been made frequently to the use of alloys in cast iron, and true enough, alloys have played a prominent part in the improvement of automotive cast iron. The alloying elements most commonly used are nickel, chromium, molybdenum and silicon; used less frequently are vanadium, titanium, copper, aluminum and calcium-silicon. For control purposes, ferrosilicon and carbon in the form of graphite are used.

There are several methods of adding alloys to iron, and generally a foundry condition exists which justifies the selection of that particular method which is most suitable to the operating procedure. The four principal methods of introducing alloys into iron are, (1) by ladle addition of the ground ferroalloy, (2) by the addition of lump ferroalloys to the furnace, (3) by using alloyed pig iron or alloyed scrap in the furnace charge, and (4) by using briquetted ferroalloys in the furnace charge.

In foundries where a number of alloyed mixtures are being made from the (*Please turn to page* 77)

Fig. 7 (Below)—Pouring a mold on the conveyor system



A. E. White, President

A. S. T. M. Holds Annual Meeting in New York

H. H. Morgan, Vice President

THE fortieth annual meeting of the American Society for Testing Materials opened June 28 at the Waldorf-Astoria, New York, with the largest attendance in the history of the society. An interesting and extensive exhibit of a wide variety of testing equipment and laboratory supplies featured the meeting.

An unusual and exceptionally impressive feature of the opening session was the awarding of honorary memberships to John A. Capp, engineer of materials, General Electric Co., Schenectady, N. Y.; Dr. Guilliam H. Clamer, president and general manager, Ajax Metal Co., Philadelphia; and Dr. Gustave W. Thompson, chief chemist and director, National Lead Co., Brooklyn, N. Y., all past presidents of the society. The only other living honorary member is Dr. Arthur N. Talbot, professor emeritus, University of Illinois, Urbana, Ill., who was elected in 1923.

Election of the following officers was announced: President, Dr. A. E. White, professor of metallurgical engineering and director, department of research, University of Michigan, Ann Arbor, Mich.; vice president, H. H. Morgan, manager rail and track fastening department, Robert W. Hunt Co., Chicago; directors, P. H. Bates, chief clay and silicate products division, bureau of standards, Washington; H. F. Clemmer, engineer of materials, District of Columbia, Washington; E. F. Lundell, assistant chief, chemistry division, bureau of standards, Washington; H. C. Mougey, chief chemist and assistant technical director, research laboratories division, General Motors Corp., Detroit; and R. L. Templin, chief engineer of tests, Aluminum Co. of America, New Kensington, Pa.

Secretary-treasurer, C. L. Warwick, in presenting the annual report of the executive committee announced the 1938 annual convention of the society will be held in Atlantic City, N. J., the last week in June. The regional meeting will be held in Rochester, N. Y., dur-

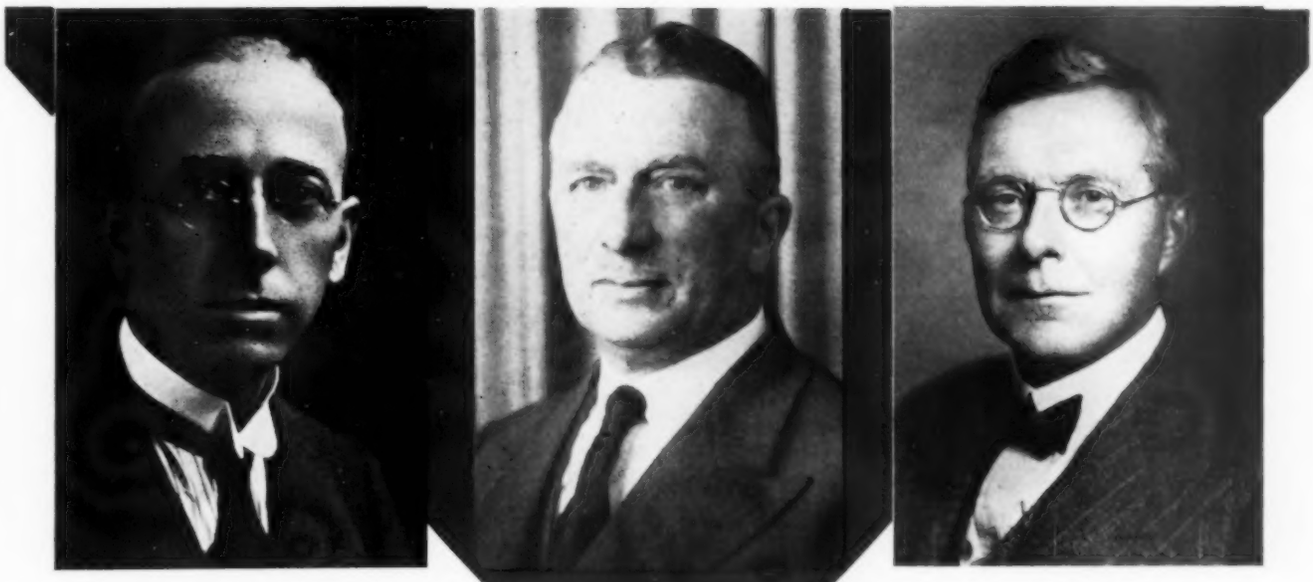
ing the winter. Membership in the society now totals 4030, a gain of approximately 275 since the 1936 meeting.

Reports of several committees and the presentation of papers dealing with the testing of cast irons, featured the final session under the chairmanship of Hyman Bornstein, Deere & Co., Moline, Ill. The report of committee A-3 on cast iron was presented by H. C. Aufderhaar, Electro Metallurgical Co., Chicago, and secretary of the committee. The report recommended that present tentative standards under the jurisdiction of committee A-3 be continued as tentative without revision. Subcommittee IV on car wheels is working on a complete revision of tentative specifications for chilled tread cast iron wheels (A 46-30 T). Subcommittee VI on general castings has under consideration the establishment of deflection values in the flexure test for inclusion in the standard specifications for gray iron castings (A 48-36). Subcommittee XI on methods of testing will conduct research work on fatigue tests of cast iron.

Top row reading left to right—R. E. Hess, A. E. White, and C. L. Warwick. Bottom row reading left to right—G. F. Wohlgemuth A. C. Fieldner, Dr. T. Smith Taylor, and W. H. Swanger

The report of committee A-7 on malleable iron castings was presented by E. K. Smith, Electro Metallurgical Co., Detroit, and chairman of the committee. The report stated that subcommittee I on nomenclature and definitions has approved the definitions of malleable cast iron and pearlitic malleable cast iron which appear in the tentative definitions of terms relating to cast iron (A 196-36 T), prepared by committee A-3 on cast iron. Subcommittee VI on pearlitic and alloy malleable iron has under consideration the preparation of proposed specifications for pearlitic malleable iron.

A paper "The Tensile Strength of Cast Iron," by J. O. Draffin and W. L. Collins, University of Illinois, Urbana, Ill., was presented by Mr. Collins. A series of tests performed by the authors indicates that different castings made from the same pouring had a variation of from 10 to 11 per cent in strength. Hollow and solid test specimens had nearly the same strength, the solid being from 2 to 5 per cent stronger. The authors found that the modulus of elasticity was not affected by any method of testing used but that the higher strength castings gave higher values. It was found that a solid machined specimen with threaded ends tested with spherical bearing blocks which allow an adjustment of the load, give actual strength values unaffected by eccentricity. Loading and unloading specimens were found to have no pronounced effect on ultimate strength or maximum unit deformation. The test showed that when the material was loaded nearly to failure and then unloaded, there was permanent deformation of 40 to 50 per (*Please turn to page* 80)



C. W. Bigg
President

J. Hepworth
Senior Vice President

W. B. Lake
Junior Vice President

I. B. F.

Considers Foundry Problems

By VINCENT DELPORT

European Manager, The Foundry

FIRST award of the E. J. Fox medal to Prof. Thomas Turner featured the thirty-fourth annual conference of the Institute of British Foundrymen, which was held at Derby from June 8 to 11, with C. W. Bigg, Qualcast, Ltd., as president. The convention was also notable for a symposium on nonferrous foundry subjects, the other papers being on wear tests, on ferrous alloys, the manufacture of ingot molds and foundry coke.

At the opening session, Mr. Bigg announced, on behalf of himself and his co-directors that the firm of Qualcast Ltd., had made a gift of £500 to the institute as an endowment fund to encourage education and technical research.

The annual general meeting of the institute was held in the afternoon of June 8, when C. W. Bigg was elected president. Votes were also taken for the other officers, and J. Hepworth, Bradford Piston & Piston Ring Co., Ltd., Bradford, Yorkshire, was elected senior vice-president, while W. B. Lake, Lake & Elliot, Ltd., Braintree, Essex, was elected junior vice-president. Mr. Lake had been honorary treasurer of the institute during the past seven years, and, therefore, a vacancy was created, which was filled by S. H. Russell, S. Russell & Sons, Ltd., Bath Lane, Leicester, past-president, who was elected unanimously. Tom Makemson was re-elected secretary, and the following members were re-elected to the council:—

Prof. J. H. Andrew, The University, Sheffield; V. Delport, Penton Publishing Co., Ltd., London; E. Longden, Didsbury Park, Manchester; P. A. Russell, S. Russell & Sons, Ltd., Leicester; D. H. Wood, Constructional Engineering Co., Ltd., Birmingham.

Following the annual general meeting, a reception was held by invitation of The Worshipful The Mayor of Derby, Councillor Mrs. Petty, J. P., and the Corporation of the County Borough of Derby.

Medals Awarded by Association

The conference opened at the Guild Hall on the morning of June 9, with H. Winterton, chairman, William Cumming & Co., Ltd., Kelvinvale Mills, Maryhill, Glasgow, Scotland, in the chair. An address of welcome was given by the Mayor of Derby, which was followed by addresses from Cecil Murray, president of the Derby Chamber of Commerce, and W. A. Richardson, principal of Derby Technical College. The president then announced that the Oliver Stubbs medal had been awarded to P. A. Russell, S. Russell & Sons, Ltd., Bath Lane, Leicester, for the considerable amount of valuable work that he had done as convener of the sub-committee on cast iron. The medal was presented by Councillor Mrs. Petty.

The award was then announced, for the first time, of the E. J. Fox medal, the recipient being Prof. Thomas Turner, of the University (*Please turn to page* 84)

QUESTIONS and ANSWERS

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Casting Roll Around Shaft Is Doubtful Procedure

We are contemplating making a number of sugar mill rolls 28 inches in length, 27 inches outside diameter. Our hydraulic press is not large enough to press in the 14-inch steel shafts. Is it feasible to cast the shells around the shafts. Would this amount of hot metal affect the shafts adversely. We are aware that the usual practice is to shrink the shells on to the shafts, but we have not had any experience in this line. We shall appreciate your opinion on the solution of this problem.

Your proposal to cast the shell directly around the shaft is open to question. Even if the heat would not affect a plain carbon steel shaft adversely—a doubtful point—we are reasonably certain the shell would crack in contracting. The molten metal would raise the temperature of the shaft to a considerable extent, but we do not think the shaft would expand sufficiently to compensate for the later contraction of the shell. It might. If we were in your place we should experiment with one and settle the point definitely.

If practicable, an alternative method would be to raise the shell area of the shaft to a red heat and then place the shaft in the prepared mold and pour the metal around it. Since casting and shaft then would cool at the same time, the casting—at least theoretically—should not crack. However, there is an element of chance in both methods and for that reason they cannot be compared with the reliable method of shrinking the shell on the shaft. In shrinkage practice the usual allowance is 0.001-inch for each inch in diameter, in this instance 0.014 or 1/64-inch less than the diameter of the shaft.

When the shell is raised to a red heat the expansion is approximately ⅛-inch. This provides a clearance of about 3/64-inch all around. However, as the diameter of the shaft increases, a smaller allowance is sufficient. In the present instance an allowance of 0.009-inch probably will be sufficient. Instead of dropping the shaft vertically through the shell, we suggest raising the shell, previously machined to the correct inside size, to a red heat and then placing it in a horizontal position where your present hydraulic press could push the shaft through the shell. With suitable rollers under the shaft or a greased slide to carry the weight, a comparatively light press should be able to do the work satisfactorily. For that matter, a good big jack screw might be employed.

Small Circular Casting Does Not Shrink Uniformly

We are forwarding for your inspection a small gray iron casting 7½ inches diameter made up of a flat rim ½-inch thick and 1¼-inch wide joined to a comparatively heavy hub by three short arms. These castings are molded two in a flask, and although we have tried various methods of gating, stripping the hub, etc., we cannot prevent the castings from shrinking out of round approximately ⅛-inch.

Theoretically this symmetrical casting should contract uniformly to produce a perfect circle. However, theory and fact do not always coincide and as a result the foundryman has to check over a great many factors which in ordinary routine are considered unimportant, or at least taken for granted. For example the pattern may not be accurate. Manifestly an untrue pattern will not produce a true casting. In the present instance the patterns may be closer to one side of the flask than the other. The side nearest the flask will cool first and set. Later the heavy hub will pull the other sides in a little. If you have checked these two possibilities and find that neither is responsible, then apparently the design of the casting is responsible for the trouble. The only remedy is to distort the pattern from a true circle so that in contraction the casting will assume the proper shape.

Porosity In Casting Is Caused By Evolution of Gas

We are forwarding for your inspection a small section of a bushing casting containing many small holes. We have had many years experience in the successful production of a wide line of nonferrous castings and are at a loss to account for these defectives. The castings are molded two in a flask horizontally and then poured on end from a long sprue that delivers metal at the bottom.

Offhand and from a merely casual examination the metal has every appearance of having been burned, but we hesitate to present that hypothesis, unless possibly your melter had an off day. On the other hand, and in view of the fact that gas holes and steam holes bear a close general resemblance in some instances, there is the possibility that the molder is ramming the sand harder than usual to prevent the castings from straining when poured on end. The remedy for that is to use a more permeable sand, or vent the present sand liberally with a wire. Again, the cores in these castings may be a little harder than usual. The vent holes may be too small, or they may be stopped. The porosity probably is caused either by gas or steam or by both. If you check up carefully on each feature in the cycle of production of the mold and cores you will discover the cause and then can adopt the proper remedial measures.

Gases Absorbed By Gear Metal Cause Risers To Swell

We have been making large chill cast bronze gears weighing 400 pounds from an alloy containing 87½ per cent copper, 11 per cent tin, and 1½ per cent nickel. We are experiencing difficulty with gases being absorbed, causing the risers to come up instead of to sink. We are fluxing with phosphor copper, 1½ pounds to the 100. We are using heavy Bunker "C" oil which shows a sulphur content of ½ of 1 per cent, and have tried other oil. We melt the charge in four crucible furnaces, about 200 pounds in each, so as to keep the metal well below the top of the crucible. We have endeavored to melt under an oxidizing atmosphere and to avoid reducing atmospheres as much as possible. We have poured the gears at temperatures from 1900 to 2200 degrees Fahr. We might say that about an hour elapsed between the time of charging the metal and the time of pouring. We have tried all sorts of gating, but do not believe that the trouble lies in that direction.

Your description of the difficulty with the bronze gears indicates that your surmise of gas absorption is correct, and the question to be settled is how to eliminate the trouble. While you state that you have endeavored to conduct your melting operations under oxidizing conditions, presumably you do not know definitely that such is the case since it requires use of gas analysis equipment and a skilled technician to determine the facts in the case.

The only suggestion we can offer as far as actual combustion is concerned, is to be sure that you are employing what is termed a sharp flame rather than one which is soft. The sharp flame is an indication that there is a slight excess of oxygen, and it is obtained by closing down the oil valve or opening up the air valve. Just which procedure to follow will depend upon your present operating conditions. That is to say, if the air valve is fully opened, the only possibility is to close off on the oil.

In that connection, another thought arises, and that is the size of the flue opening. If the flue opening is too small so as to prevent a fairly rapid removal of the gases of combustion, there is a possibility of a reducing condition, and we suggest that you see that the flue openings are sufficiently large. You mention that you are pouring at temperatures ranging from 1900 to 2200 degrees Fahr., but not whether those temperatures are determined by pyrometer or by eye.

If those temperatures are determined by the latter method we suggest that you change to a pyrometer since the eye is not infallible. If you are using a pyrometer, there is a possibility that the temperature readings are not correct unless you have had the instrument checked at regular intervals. A pyrometer is a rather delicate instrument which receives rather severe usage in the foundry, and it must be checked from time to time to insure that it operates properly.

Possibly with the large castings you are pouring, the temperature may be decreased from the ranges you mention, and that might aid in reducing the tendency of the risers to swell. Incidentally, there is no standard pouring temperature except those that have been determined previously by experiment. In other words, each casting or group of castings of similar form, have a set pouring temperature which is determined by actual experiment, and once that temperature is ascertained it should be rigidly adhered to.

You do not mention whether you are using a cover charge of some kind with the idea of protecting the metal during melting. If so, we suggest trying to melt the metal without it. In many foundries little if any cover charges are used when rapid melting is obtained. In other words, when the metal is melted rapidly and removed from the furnace as soon as it reaches the proper temperature, there is little chance for gas absorption, and consequently there is no need of a protective cover.

Gives Iron Pot Composition For Melting Aluminum

We have a large number of aluminum castings to make, some No. 12 alloy, and the remainder a corrosion resistant 6.5 silicon alloy. Can we make these castings satisfactorily in permanent molds? What is the best composition for iron pots in which to melt the aluminum.

Aluminum castings are poured extensively in permanent molds. Your problem resolves itself into one of comparative cost based on the proposed output. Satisfactory iron pots for melting aluminum are made from a mixture containing approximately 30 per cent steel, 0.70 per cent chromium, 1.50 per cent nickel and conforming to the following approximate analysis: Total carbon 3.00 to 3.30 per cent, silicon 1.00 to 1.20 per cent, sulphur under 0.10 per cent, phosphorus 0.30 per cent, manganese 0.50 to 0.70 per cent.

Gassy Metal May Be Cause of Trouble

We are having trouble with our bronze castings which are made of an alloy containing 88 per cent copper, 10 per cent tin, and 2 per cent lead. Sometimes they are satisfactory, but more often they are porous, due apparently to gaseous metal. Is there any way by which these gases may be eliminated without seriously affecting the acid resisting qualities of the mixture.

While you suggest that the trouble with your bronze castings is the gassy metal, it is possible that the trouble may arise from lack of proper feeding or from improper pouring temperature. However, if the difficulty is from gassy metal caused by improper melting conditions, it usually shows up as pin holes distributed throughout the whole casting rather than restricted to any one particular portion. Another characteristic is that in general, the pin holes are not revealed until the outer skin has been machined away.

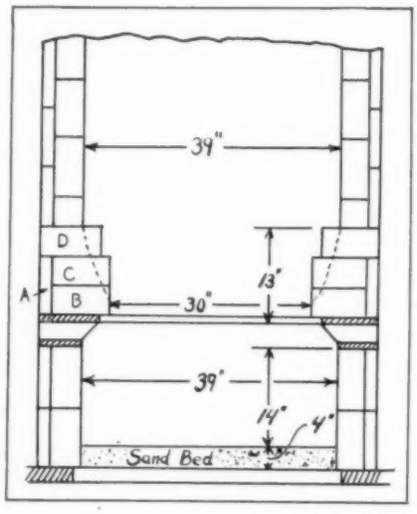
Gassy metal troubles may be eliminated by close attention to melting to see that the operation is conducted under slightly oxidizing conditions. The proper procedure to pursue will depend upon the fuel used for melting. If coke pits are employed, see that the flue openings to the furnace are ample to carry out the products of combustion, and the ash pit openings are large enough to promote rapid combustion. If oil firing is employed, the burners should be adjusted so that the small excess of oxygen above that required for combustion, is supplied. Also see that the metal is melted as rapidly as possible, and not permitted to remain in the furnace for any length of time.

Improper feeding has been mentioned, and without any knowledge of the type of casting involved, it suffices to say that close attention should be given to the location and size of gates and risers. The third point of proper pouring temperature must be considered carefully as the alloys are quite sensitive to that phase. As is the case with any alloy, each particular type of casting has a best pouring temperature which gives the most satisfactory results. That temperature is determined, of course, by experiments, starting at some one definite temperature and going up or down from that until the best results are obtained. In the case of the particular alloy in question, it is suggested that the pouring be tried at a temperature of 2100 degrees Fahr., and then proceeding up or down as the results indicate. Observation of the fracture will indicate when the proper pouring temperature has been reached.

According to Dews, a good sound bronze shows a fracture just sufficiently crystalline to be recognized as such, which shows a narrow blue skin where the metal has been in contact with the mold, and which is entirely free from red or brown patches. Too low a casting temperature leads to a fracture which is *cokey* without any definite signs of crystallization and which is discolored. A high casting temperature produces coarse crystallization as well as discoloration.

Boshed Lining in Small Cupola

We are contemplating relining a cupola 51 inches diameter inside the shell. We plan to line from the bottom to the melting zone 30 inches diameter and 39 inches from that point to the top. The cupola has one row of tuyeres. How far above the tuyeres should we begin increasing the diameter inside the lining.



Sketch showing principal details of boshed lining

The accompanying illustration is typical of boshed construction using the regular fire brick. The hearth or crucible is lined to the same thickness as the cupola above the melting zone. This is done for several reasons: (a) To provide greater holding capacity. (b) To provide a coke bed in keeping with the volume of material above the tuyeres. (c) To prevent metal from dribbling into the tuyeres. (d) To shoot the blast more toward the center and thus preserve the lining. (e) To provide a short tap hole and slag hole without altering the shell of the cupola in the vicinity of these two openings. The ordinary firebrick is approximately 2¼ x 4¼ x 9 inches.

Two courses of brick laid on end will fill the space between the bottom plate and the bottom of the tuyeres. The layer of brick next to the shell is laid with the 4¼-inch face against the steel. The inner layer is laid with the long, narrow face of the brick pointing toward the center of the cupola. The tuyeres are placed on top of this wall. The distance between the bottom of the tuyeres and the bottom plate of the cupola is 18 inches, and this distance of course is reduced by approximately 4 inches when the sand bed is rammed on the bottom.

This distance is not arbitrary. The furnace will function with tuyeres at practically any height from 4 inches to 40. The 18-inch height shown in the illustration is fairly typical. The lining above the tuyeres is built as shown. One course of brick, *A*, on end is laid with the 4¼-inch face against the shell. Two courses *B* and *C* then are laid on edge horizontally. These are followed by another course *D* laid in the same manner, but with the outer ends against the shell.

The remainder of the lining then is built as shown in two layers of brick on end, one layer flat against the shell and the inner layer with the narrow face toward the center of the cupola. The cupola man may chip the corners of *B*, *C* and *D* if so inclined, but it is not necessary. After one or two heats these corners will burn off to form the curved line shown in dots. Special cupola blocks may be substituted for fire brick. They involve less trouble in setting and present a lesser number of joints for disintegration. Special fire stone slabs find favor among many foundry men engaged in running long heats.

Steel Not Cast In Metal Molds

Where can I find references to the use of permanent molds for steel castings. Can you give me a list of foundries where steel castings are made in this manner.

Enterprising foundrymen on several occasions in the past have experimented with permanent molds for the production of steel castings, but almost invariably the process has been abandoned as uneconomical and impracticable. In some steel plants where a maintenance foundry is operated for repairs and replacements, permanent molds for plain, simple shapes are in use, but so far as we know no commercial foundry produces steel castings in permanent molds. The foregoing, of course, does not include ingots for steel mills. These castings always are poured in metal molds.

Produce Solid Balls By Spinning

Occasionally we receive an order for 8-inch diameter cast iron balls for ball mills. Up to the present we have found no satisfactory method to cope with the shrinkage problem. In one method we have placed a precast 4-inch diameter ball inside the mold and poured the larger ball around it. This produces a solid casting, but we are not satisfied since when the ball wears down the remaining thin shell may crack or spall. We are considering the advisability of making the mold for future castings in a two part dry sand core with a single small gate on top fed from a large basin. We shall appreciate any suggestions on the solution of our problem.

Whether the mold for an 8-inch diameter ball is made in green or dry sand, the casting will show a shrinkage cavity on top unless it is fed through such a large riser that the extra metal and the cost of removal render the method uneconomical. If the neck between the basin and the casting is constricted, the metal will freeze there before the basin has fulfilled its expected function of delivering metal to the casting.

If you are not satisfied with the method of placing a precast smaller ball in the mold and desire to experiment with other methods, you cannot do better than adopt the method employed by early American foundrymen in casting cannon balls. The iron was poured into a mold suspended on trunnions and kept revolving slowly until the metal had solidified. A simple device readily could be constructed to hold, say, a dozen of your present type core molds. Instead of a large basin a small gate approximately ¾-inch in diameter will conduct the metal into each mold. The metal in this gate will solidify in a few seconds. The device then can be set in motion by a small direct connected motor or a belt from a line shaft.

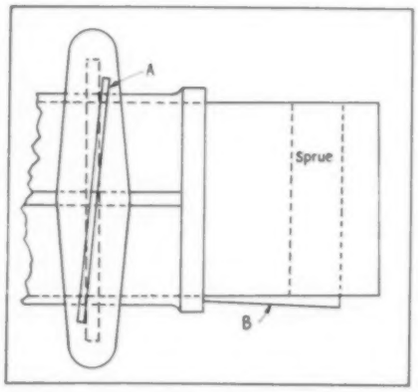
Eliminate Sticking In Core Dryer

We use river sand bonded with linseed oil for our radiator cores. A certain amount of this sand sticks to the dryer, thus reducing the size of the core and increasing the weight of the casting. Is there any method or any material we can use to overcome this form of trouble.

By using a minimum amount of oil and water, which means working the sand as dry as possible, the trouble can be overcome to a certain extent, but linseed oil alone is not a satisfactory binder for radiator cores which are dried in dryer shells. Varying amounts of kerosene oil and rosin depending on the characteristics of the sand, added to the linseed oil will prevent the sand from sticking to the dryers. The exact amount for any given type of core must be worked out by experiment. However, manufacturers of core oils have developed special mixtures and our suggestion is that you secure a supply and use it according to the manufacturers' direction, thus eliminating delays and more or less unsatisfactory and costly experimentation.

Dirt Is Traced to Various Causes

We are forwarding for your inspection a casting showing several surface defects and will appreciate your opinion on the probable cause. We have made these castings for a considerable period without any trouble. The defective castings appeared only recently. Our sand and molding practice are the same as usual. We have made a slight change in the cupola charge, but do not see how that should have an effect.



Metal from the gate A impinges on the sides of the brackets. Gate shown at B will deliver metal quietly

Theoretically your method of gating is fairly satisfactory, but in practice as shown on the casting submitted the gate has been shifted from the theoretical position. Instead of discharging metal straight into the rib, the gate drives the metal against the corner with sufficient force to wash away a small quantity of sand.

This thin film of sand or scum does not flow all the way through the casting, but adheres to the wall of the ribs in the vicinity. A small amount in the present instance also has adhered to the face of the main core directly in front of one of the ribs. Either the small dry sand core containing the gate does not fit snugly in the print—a rather improbable supposition—or, the pattern for the gate in the corebox is not held properly in place.

Unless there is an imperative reason for gating the casting on the feet, we suggest changing the gate to the bottom at one end as shown in the accompanying sketch. In the present method all the metal enters the mold through narrow ribs between sand pockets. Unless these pockets are extremely permeable, or are vented with a wire, they will cause the iron to flutter. This condition is accentuated by the swiftly flowing stream and the combined result is that some of the sand is washed away with the stream.

Brass Castings Eat Into the Mold

We are having considerable trouble with brass castings, particularly bushings and bearings which eat into the mold and core. The cores are made of a mixture of beach sand, red clay and rosin and coated with plumbago. We mix some flour with the molding sand. The castings are made from a miscellaneous scrap mixture. We shall appreciate your advice on how to make up mixtures for the different classes of castings. Also on how to prepare a sand that will produce smooth castings.

A complete treatise on the forgoing questions would embrace the whole field of brass casting production. The obvious answer to the first question is that only a man of long practical experience is qualified to select material from a miscelaneous scrap pile and transform it into a casting presenting definite physical properties. There is no short cut road to this form of knowledge. The *Foundrymans Handbook* contains tables covering the analysis of all classes of castings, also related information on colors, physical properties, tests, applications, etc.

With such a book for a guide the foundryman would be in position to experiment intelligently with his available scrap pile. The best advice in regard to the sand is to secure a supply of sand that will produce smooth castings. However, as with other forms of advice you may claim that your isolated position involving high freight rates prevents you from adopting this method. From your description we are inclined to the opinion that your sand contains too much clay. This material reduces the refractoriness and the permeability of the sand. We suggest you improve the quality by adding beach sand to the facing mixture. At this distance it is impossible to suggest the exact amount, but roughly speaking add as much as the sand will stand and still remain workable. The clay should be omitted from the core sand mixture.

R. R. Deas Jr.

H. C. Robson

Harold W. Johnson

Walter Gerlinger

MEN of INDUSTRY

R. R. Deas Jr., assistant to the vice president, American Cast Iron Pipe Co., Birmingham, Ala., has been elected chairman of the Birmingham Chapter of the American Foundrymen's association. Mr. Deas was born in Hahnville, La., Nov. 8, 1898. He was educated in the Birmingham schools and attended the University of Alabama. Since March 10, 1914 he has been connected with the American Cast Iron Pipe Co. in the following positions: Apprentice patternmaker, assistant patternshop foreman, clerk and casting inspector, engineering department, melting department, chemical laboratory, superintendent of pipe plants, plant superintendent and assistant to the vice president. Mr. Deas assisted in the organization of the Birmingham chapter. He is a member of the American Foundrymen's association, the American Institute of Mining and Metallurgical Engineers, the American Welding society and the Engineers club of Birmingham.

♦ ♦ ♦

H. C. Robson, formerly operating superintendent, Link-Belt Co., Chicago, now is affiliated in the same capacity with the Continental Roll & Steel Foundry Co., East Chicago, Ind.

Mr. Robson was born in Chicago and received his early education in that city. Following his graduation from high school, he became associated with the Link-Belt Co. first in the machine shop and later in the time study department, concurrently taking night and extension courses at Armour Institute of Technology. In 1936 he was promoted to the position of operating superintendent of the Link-Belt organization. Mr. Robson, who has written extensively on industrial management for the technical press, is the author of one of the papers presented at the annual convention of the American Foundrymen's association held in Milwaukee in May. He also is a member of the Society for the Advancement of Management, formerly the Society of Industrial Engineers.

♦ ♦ ♦

Harold W. Johnson, foundry and plant engineer, Greenlee Foundry Co., and North Western Foundry Co., Chicago, has been elected chairman of the Chicago Chapter of the American Foundrymen's association. Mr. Johnson was born in Philadelphia in 1903 and has resided in Chicago since 1904. Following his public school training, he was graduated from Armour Institute of Technology in 1923 with a bachelor of science degree in civil engineering. He also attended the University of Chicago. Following graduation, he became associated with Sargent & Lundy, Chicago, as designing engineer. After 2 years he resigned that position to become bridge designing engineer for the city of Chicago, and in 1929 accepted his present position. Mr. Johnson has served 1 year as director of the Chicago chapter and 1 year as vice chairman. He is also a member of the American Society for Metals.

♦ ♦ ♦

Walter Gerlinger, president, Walter Gerlinger Inc., Milwaukee, and newly elected president of the Milwaukee Chapter of the American Foundrymen's association, was born in 1896 and attended the Milwaukee and West Allis public schools. He received his mechanical and chemical engineering training through extension courses and spent some time in the chemical laboratory of the Allis-Chalmers Mfg. Co., Milwaukee. Later he worked in the plant of the Gerlinger Electric Steel Casting Co. as an apprentice molder, coremaker and melter.

In 1918, Mr. Gerlinger assisted in organizing the Atlas Foundry Co., Milwaukee, manufacturers of gray iron castings, and served that company for two years as secretary, at which time the company was absorbed by the Gerlinger Electric Steel Casting Co. He was elected secretary of that organization and supervised purchasing and production. In 1923 Mr. Gerlinger became vice president and general manager of the Gerlinger Electric Steel company and served in that capacity until 1927 when he resigned to organize the Walter Gerlinger Inc.

♦ ♦ ♦

Martin Rieger Jr., formerly connected with the Weston Electrical Instrument Co., recently has become connected with the New York office

(*Continued on page* 42)

The Balanced Blast Cupola, developed and perfected by the British Cast Iron Research Association, represents a distinct advance in foundry practice and a distinct saving in foundry costs. Protected by British Patents, USA Patents and Patents in Foreign Countries.

Saves 20% to 40% on COKE

The Balanced Blast Cupola offers these distinct advantages and savings because of a new and ingenious method of scientific control of the distribution and measure of the blast:

- √ **Reduced COKE consumption, from 20% to 40%, that quickly pays for the installation**
- √ **High iron temperature at the spout**
- √ **Iron free from oxidation**
- √ **Hot metal from start to finish**
- √ **A more accurate control of iron analysis**
- √ **Reduction in scrap and defective castings as result of higher temperatures and freedom from oxidation**

Photo, right, shows a 90" Shell (72" Conventional Cupola) that was converted to a 66" Balanced Blast. This Cupola melts 21 tons grey iron per hour on a coke ratio of 1:15, spout temperature 2660 Fahr.

WRITE

The Balanced Blast System is applicable to any Cupola, old or new, for grey iron or cupola malleable. Let us tell you how it will reduce your melting costs. Write for details now without obligation!

Balanced Blast CUPOLA

McWANE CAST IRON PIPE COMPANY

FOUNDRY ENGINEERING DIVISION

USA Licensee **Birmingham, Ala.**

(*Continued from page* 40)

of the Foxboro Co., Foxboro, Mass., as a specialist in the pyrometer division. CARL E. SPROUT has been appointed an associate of B. W. SAYER, district manager of the Portland, Oreg. office of that company.

♦ ♦ ♦

WILLIAM E. WILLINGALE, secretary-treasurer of the Vulcan Iron Works, Wilkes Barre, Pa., has been elected a director of that firm to succeed the late John B. Vaughn.

♦ ♦ ♦

HARVEY T. HARRISON has been appointed sales manager for the Duraloy Co., Scottdale, Pa. For several years Mr. Harrison was in charge of sales in the Cleveland territory for that company.

♦ ♦ ♦

JAMES P. WILLIAMS, formerly connected with the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., has been made works industrial engineer at the Newburgh Works of the American Steel & Wire Co., Cleveland.

♦ ♦ ♦

EDWARD SWICK of the Buffalo works, Worthington Pump & Machinery Corp., East Harrison, N. J., has been elected president of the Buffalo Chapter of the National Association of Cost Accountants.

♦ ♦ ♦

FRANK B. ELIASON recently has become associated with the Pennsylvania Foundry Supply & Sand Co., Philadelphia, in a sales managerial capacity. Mr. Eliason was connected with the J. W. Paxson Co. and Paxson-Taggart Inc. for 25 years, during the greater part of that period specializing in the equipment, supplies and facings sales.

♦ ♦ ♦

DONALD C. BAKEWELL has resigned as vice president and chairman of the executive committee, Continental Roll & Steel Foundry Co., East Chicago, Ind., in which capacity he has served since 1930, to become special representative of Blaw-Knox Co. He will make his headquarters at the executive offices in Pittsburgh.

♦ ♦ ♦

W. J. DONNELLY, formerly secretary, Smith Steel Foundry Co., Milwaukee, has been appointed treasurer, according to an announcement made by Edward A. Bacon, president of the company. P. W. KAUFMANN has been made secretary and will continue his office as controller.

OSCAR F. PATZKE, formerly sales manager of the Milwaukee Steel Foundry Co., has been appointed sales manager of the Smith Steel Foundry Co. He has been in both production and sales connections with Milwaukee steel foundries for more than 25 years, including 12 years with the old National Steel Foundries.

♦ ♦ ♦

W. G. HULBERT, who was appointed general works manager of the Taylor-Wharton Iron & Steel Co., High Bridge, N. J. on May 1, has been elected vice president of the company succeeding the late S. M. Buck. Mr. Hulbert continues his duties in charge of manufacturing

W. G. Hulbert

at both the High Bridge and the Easton, Pa. plants of the company.

♦ ♦ ♦

FRANCIS LESLIE and U. V. WESTOVER, have been appointed sales engineer in the New York territory by the Harnischfeger Corp., Milwaukee. Mr. Westover for a number of years was foreman and welding supervisor in charge of the training of welder operators with the National Malleable & Steel Casting Co., Cleveland.

♦ ♦ ♦

JOHN B. CAMPBELL has been elected vice-president of Pettibone-Mulliken Co., Chicago. Mr. Campbell has been general manager of the company since joining it in 1932. Previously for 10 years he was associated with Fairbanks, Morse & Co. at Beloit, Wis. H. R. PREST has been elected secretary and treasurer. H. J. BRAZELTON has been named assistant secretary and assistant treasurer. The offices of president and chairman of the board have been left vacant temporarily.

♦ ♦ ♦

G. W. MCLEARY has been made assistant foundry superintendent, stainless steel division, the Shawinigan Chemicals Ltd., Shawinigan Falls, Que. Mr. McLeary first became connected with the foundry industry as a molder with the Consolidated Mining & Smelting Co. of Canada Ltd., Trail, B. C. He remained with that company from October 1926 until May 1936, during which time he completed three different courses in foundry practice. He then became connected with the Dominion Engineering Works, Montreal, Que., as assistant foundry foreman and remained there until accepting his new position. While with the Dominion Engineering Works he also took a night course in metallurgy at McGill university.

♦ ♦ ♦

JOHN WILBUR, connected for the past year and one half with the New York office of the Electro Metallurgical Sales Corp., recently has been appointed to the Cleveland office of that organization. Following his graduation from Yale university in 1933, Mr. Wilbur became associated with the Niagara Falls works of Electro Metallurgical Co. Both organizations are units of Union Carbide & Carbon Corp.

♦ ♦ ♦

W. B. LAKE (see page 35), recently elected junior vice president of the Institute of British Foundrymen, was educated at Witham, Essex and Greifswald, Pomerania. He served his apprenticeship with Barnard & Lake, a firm of agricultural engineers, and later became works manager. In 1894 Mr. Lake started in business for himself as an engineer. Later he was joined by E. F. Elliot and the firm of Lake & Elliot was established. That company became a pioneer in the manufacture of steel castings, being the first to produce successfully low carbon crucible castings. In addition to steel castings, the company now produces high duty gray iron castings. Mr. Lake was president of the London branch of the institute for two years, and held the office of treasurer for the past seven years.

♦ ♦ ♦

H. H. MORGAN (see page 33), manager of the rail and track fastenings department, Robert W. Hunt Co., Chicago, has been elected vice president of the American Society for Testing Materials. Mr. Morgan received a degree in mechanical engineering from Lewis institute, Chicago, in 1904 and became associated with the Robert W. Hunt Co. following his graduation. He served that organization in various capacities being in charge of miscellaneous inspection from 1907 to 1912, manager of physical testing laboratories from 1910 to 1917 and as manager of cement testing laboratories from 1912 to 1917. From 1917 to 1918 he represented the Robert W. Hunt Co. in Washington, for war materials inspection for engineer corps, and then became manager of the Pitts-

(*Concluded on page* 45)

(*Concluded from page* 42)

burgh office. He has been in his present position since 1928. Mr. Morgan has been active in A.S.T.M. work and is a member of numerous societies including the American Society of Mechanical Engineers, the American Society of Metals, the Western Society of Engineers, the American Railway Engineering association and the American Transit Engineering association. He has just completed a two-year term as a member of the executive committee of the American Society for Testing Materials.

♦ ♦ ♦

A. E. WHITE (see page 33), professor of metallurgical engineering and director of the department of engineering research, University of Michigan, Ann Arbor, Mich., recently was elected president of the American Society for Testing Materials. Following his graduation from Brown university in 1907 and a year of study at Harvard, Dr. White joined the Jones & Laughlin Steel Co. as head of research on blast furnace byproducts, ores, etc. In 1911 he became instructor at the University of Michigan and an assistant professor from 1913 to 1917. From 1917 to 1919 Dr. White served in the ordnance department of the United States, was head of the metallurgical branch, inspection division, and headed the technical staff of the metallurgical branch. He has held his present positions since that time. Dr. White is active in the work of several A.S.T.M. committees in the metals field and is chairman of the steel committee's group on materials for high temperature service. He was the first president of the American Society for Metals and is a past chairman of the research committee, American Society of Mechanical Engineers. In 1925 he was awarded a doctor of science degree from Brown university. From 1933 to 1935 he was a member of the A.S.T.M. executive committee and served as vice president from 1935 to 1937.

♦ ♦ ♦

LOUIS B. NEUMILLER, formerly manager of the central sales division, Caterpillar Tractor Co., Peoria, Ill., has been named director of industrial relations for that company, a new post created because of employment growth.

♦ ♦ ♦

STEPHEN BONA recently was made general superintendent of the National Foundry Co. of New York Inc., Brooklyn, N. Y. Previously, Mr. Bona had been associated with the Producto Machine Co., Bridgeport, Conn. Prior to that he was general foreman of the gray iron division, Eastern Malleable Iron Co., Bridgeport. Mr. Bona also was superintendent of the Walker-Stewart Foundry Corp., Plantsville, Conn. Before that, was connected with the Eastern Malleable Iron Co., Naugatuck, Conn., Singer Mfg. Co., Elizabethport, N. J. and the Holaday-Telford Co., Waterbury, Conn.

Milwaukee Chapter Elects Officers

An interesting program featured the meeting of the Milwaukee chapter of the American Foundrymen's association held June 18 at the Schroeder hotel. L. P. Robinson, Werner G. Smith Co., Cleveland, led the discussion on "Core Practice" which covered the following subjects: Proper selection of cores; proper selection of binders; proper ratios; proper mixing; moisture control; proper baking; proper venting; proper inspection; effect on cleaning conditions; effect on molding conditions. Practically all members of the Milwaukee chapter participated in this discussion.

Diplomas and checks were presented to the four Milwaukee boys who were winners in the apprentice contest held during the Milwaukee convention of the American Foundrymen's association. Also, three students of the Milwaukee Vocational school were given awards on essays written regarding the foundrymen's convention.

The following officers were elected for the coming year: Chairman, Walter Gerlinger, Walter Gerlinger Inc.; vice chairman, Roy M. Jacobs, Standard Brass Works; secretary, William J. MacNeill, Federal Malleable Co.; treasurer, William J. Donnelly, Smith Steel Foundry Co.; directors, William F. Bornfleth, Cutler-Hammer Inc.; B. D. Claffey, General Malleable Corp.; R. S. MacPherran, Allis-Chalmers Mfg. Co.; L. S. Peregoy, Sivyer Steel Casting Co.; and A. C. Ziebell, Universal Foundry Co., Oshkosh, Wis.

Stresses Sand Before Buffalo Chapter

The first regular meeting of the newly formed Buffalo chapter of the American Foundrymen's association was held at the Hotel Buffalo, June 8 with Chairman T. H. Burke, presiding. Over 80 foundrymen from Buffalo and the surrounding territory were present. Dan M. Avey, secretary-treasurer, American Foundrymen's association, gave a short talk welcoming the new chapter.

Harry W. Dietert, Harry W. Dietert Co., Detroit, presented the principal address on the subject of sand control. Mr. Dietert discussed three elements, namely water, silica grains and bond, which go to make up molding sand. The action of each of the elements in the mold when metal at high temperature is introduced, was explained in detail. Mr. Dietert stressed the importance of proper mold hardness and warned against ramming too hard. He stated that flasks should be vented properly, that bars should be used in the flasks, and that a flask of the proper depth should be used.

Following the formal discussion, Mr. Dietert tested a number of sand samples supplied by the foundrymen present and discussed the results of these tests in the light of the type of sand best suited for the work produced at the foundries from which the sand samples were secured. A buffet lunch was served at the close of the meeting.

Apprentice Training Is Considered

Apprentice training was the discussion subject at the last meeting of the 1936-1937 season for the Chicago chapter, American Foundrymen's association, held June 14. V. J. Hydar, personnel manager, Falk Corp., Milwaukee, was the principal speaker.

The speaker, who is chairman of the association's apprentice training committee, deplored the lack of guidance afforded high school students during their course of study, a situation which leaves many graduates ill-fitted to pursue mechanical trades. Apprentice material is more plentiful than the capacity for training, but the subject needs publicity to attract candidates to industry via the apprentice route, he stated.

The widespread use of machinery has not curtailed the market for skilled workers, Mr. Hydar maintained, and this market can be best cultivated through apprentice training. Experiences of the Falk Corp. during its 17 years of apprentice work have shown that the department pays its own way.

Later discussion centered about an Illinois senate bill proposing standardization of apprentice training.

At the annual election of officers of the Chicago chapter, held in conjunction with the meeting, H. W. Johnson, Greenlee Foundry Co., was chosen chairman to succeed L. J. Wise, Chicago Malleable Castings Co. Other new officers include: Vice chairman, L. H. Rudesill, Griffin Wheel Co.; secretary, W. G. Gude, THE FOUNDRY; treasurer, C. C. Kawin, Chas. C. Kawin Co.

Hydraulic institute, 90 West street, New York, has published the seventh edition of its standards for the pump industry. Copies of the book may be obtained for $1.00 from C. H. Rohrbach, secretary of the institute.

Total Foundries in the United States and Canada, June 1, 1937

Tabulates United States and Canadian Foundries

TABULATION of data compiled from the 1937-38 edition of *Penton's Foundry List* just published, reveals that the United States now has 5001 foundries and Canada 463, thus making the total for the two countries 5464 as compared with 5543 in 1935.

These figures indicate a net loss of 72 casting shops in the United States and seven in the Dominion since the last previous count was made just two years ago. Computed on a yearly basis, the loss was 40 per year during the past two years and 74 per year during the previous five year period.

The slight decrease in the total number of foundries probably represents a continuation of the mortality accompanying the depression years. Substantial improvement in business did not arrive for a full year after the last count was made, and during that time considerable change took place. Numerous firms discontinued operations while others, listed as idle in 1935, were liquidated. However, statistics gathered in the preparation of the new list indicate this trend has been checked. During the past two years numerous new foundries have been placed in operation. At the same time many changes have been made in company names, location, etc.

As may be noted in the complete compilation on page 48, each of the four branches of sand cast foundries showed some decrease. Although the exclusive nonferrous classification increased from 1224 in 1935 to 1277 in 1937, the grouping of nonferrous foundries as departments of other plants decreased from 1292 to 1224. Thus, the nonferrous branch, which includes both classifications, lost 34 shops in the two years period. The total number of permanent mold shops listed increased from 77 in 1935 to 140 this year, and the die casting plants showed an increase of 5. Six less foundries were reported operating machine shops, but 66 more are maintaining patternshops.

Ten states show an increase in the number of foundries. Wisconsin leads in this respect with a gain of 62, California is next with 25 and Washington is next with 8. However, this does not result in any change in the relative standings of the leading foundry states. Pennsylvania still leads with 591, and is followed by Ohio with 533, New York with 416, Illinois with 386, Michigan with 324, California with 294, Wisconsin 289, Massachusetts with 210, Indiana with 206, New Jersey with 184, Connecticut with 122 and Missouri with 111. The report by states is shown on the map at the top of this page.

In the roll call of cities, Los Angeles replaces Cleveland in second place, the latter city dropping to

(*Concluded on page* 48)

6 NEW FEATURES — *In One Machine*

ONLY THE JOHNSTON & JENNINGS NO. 260 JOLT SQUEEZE CAN GIVE YOU

1 **AN ADJUSTABLE SQUEEZE HEAD** that permits the pressure plate to be set at *any* desired distance above the top plate by simply changing the setting of two lock nuts . . . thereby facilitating the rapid changing of the machine from one height flask to another, *by the moulder* . . . and conserving time and air.

2 **PERFECTLY BALANCED SQUEEZE HEAD**—spring controlled, and adjustable—to balance the squeeze head in the moulder's most convenient position . . . eliminating stretching and long reaching.

3 **SPECIALLY DESIGNED RACK** to support match plates and patterns . . . and rubber guarded to protect them against injury.

4 **MECHANICAL SQUEEZE HEAD LOCK** which latches automatically to hold the pressure plate in an upright position producing an even squeeze *at all times* . . . yet unlatches instantly as the squeeze head is pushed back.

5 **CLOSING BENCH AND RIDDLE RACK** newly designed and conveniently located . . . and furnished as standard equipment.

6 **IMPROVED CUT-OFF VALVE** for jolting—reducing air consumption to a minimum.

Write FOR FULL DETAILS OF THIS ONLY-ONE-OF-ITS-KIND MOLDING MACHINE

• Pictured herewith, the new No. 260 Jolt Squeeze machine features the many cumulative improvements developed by Johnston & Jennings' engineers—and in addition—6 new features that are now being made available for the first time in any machine—of any kind. Each of these new features is a definite and positive customer advantage that will speed up your output and permit the use of a Jolt Squeeze machine with a greater efficiency over a wider range of flask sizes.

Write for the descriptive folder. It will give you full details of the more economical and more profitable operation that can be yours with this new machine . . . and complete specifications. Send for a copy of the folder today.

The JOHNSTON & JENNINGS *Co.*

Addison Road and N.Y.C. Tracks
CLEVELAND . . . . . OHIO

(*Concluded from page* 46)

third. St. Louis moves into ninth place, in place of Cincinnati which moves to tenth. Baltimore jumps from sixteenth to fourteenth, Seattle moves from eighteenth to sixteenth, and Newark, N. J., drops from fourteenth to seventeenth. The several changes in the standing of other leading foundry cities may be noted in the table on page 59.

A 3-year research program on the fundamental properties and behavior of tin has been established at the metals research laboratory, Carnegie Institute of Technology, Pittsburgh, by Bristol-Myers Co., Hillside, N. J. Dr. Gerhard Derge will head the group assisted by John W. Stewart and Paul A. Beck. The work will be devoted to the science of tin rather than to its practical applications, and the results will be published as a contribution to science.

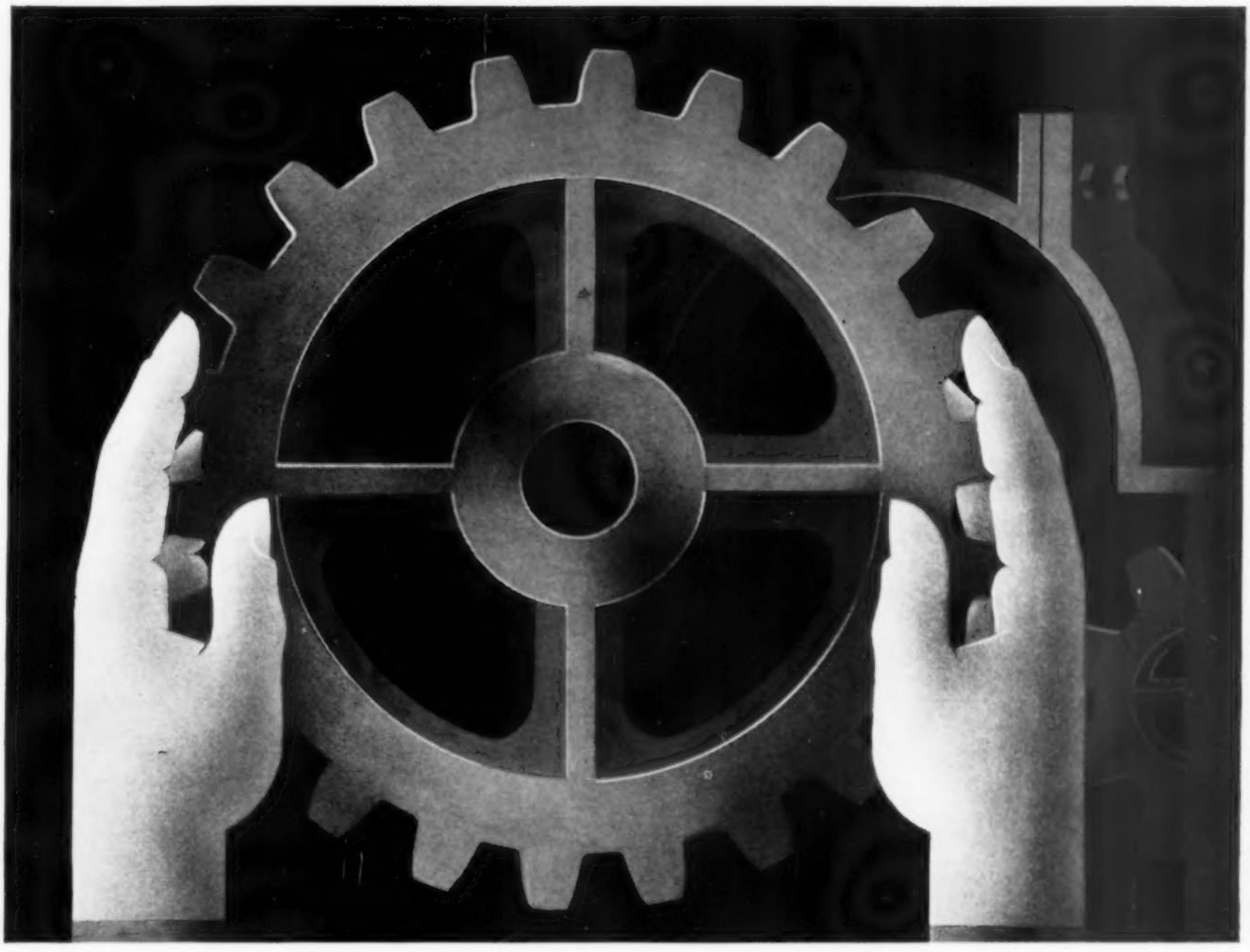
Iron and Steel Institute, London, has published a special report No. 15A which is a supplement to special report No. 15 entitled "Second Report of the Steel Castings Research Commitee," and which was reviewed in the February issue of THE FOUNDRY. The present report consisting of 36 pages contains the discussion, correspondence, and committee's reply.

Statistical Report Is Published

American Iron and Steel institute recently has published its twenty-fifth annual statistical report giving information on the iron and steel and some related industries in the United States and Canada in 1936. Statistics include production of pig iron and ferroalloys; scrap consumed in blast furnaces and steel making furnaces; production of steel and rolled products; capacity and production for sale; exports of iron and steel; imports of iron and steel; ore statisticals; coal and coke statistics; market prices; Canadian and other foreign statisticals.

Foundries of the United States and Canada—1937 and 1935

	Total Foundries 1937	Total Foundries 1935	Increase or Decrease in two years	Gray Iron Foundries 1937	Gray Iron Foundries 1935	Steel Foundries 1937	Steel Foundries 1935	Electric Steel 1937	Electric Steel 1935	Malleable Iron Foundries 1937	Malleable Iron Foundries 1935	Exclusive Nonferrous Foundries 1937	Exclusive Nonferrous Foundries 1935	Nonferrous Foundries Dept. of Other Shops 1937	Nonferrous Foundries Dept. of Other Shops 1935	Total Nonferrous Foundries 1937	Total Nonferrous Foundries 1935	Foundries Melting Aluminum 1937	Foundries Melting Aluminum 1935	Permanent Mold Castings 1937	Permanent Mold Castings 1935	Die Castings 1937	Die Castings 1935	Machine Shop 1937	Machine Shop 1935	Pattern Shop 1937	Pattern Shop 1935	Centrifugal Castings 1937
Alabama	92	98	—6	81	82	3	5	2	2	2	1	8	8	16	22	24	20	6	30	2	2	1	..	65	64	67	68	1
Arizona	7	13	—6	7	9	2	2	2	2	..	..	..	..	6	8	6	8	5	4	1	..	..	..	5	5	7	9	..
Arkansas	18	17	+1	16	17	1	1	1	1	..	..	2	..	10	12	12	12	8	9	..	..	..	..	16	15	11	10	..
California	294	269	+25	142	146	24	31	23	27	3	4	91	86	67	68	158	154	143	128	11	7	9	5	132	129	134	131	2
Colorado	42	42	..	25	27	3	4	4	2	..	..	13	13	10	10	23	23	21	19	2	2	..	..	25	25	18	20	..
Connecticut	122	135	—13	60	58	6	6	3	5	7	12	49	54	15	32	64	86	67	70	2	4	3	4	80	79	78	81	..
Delaware	11	11	..	5	5	2	2	1	1	1	1	3	3	3	5	6	8	4	5	..	..	..	..	9	9	8	8	..
Dist. of Columbia	7	7	..	5	5	1	1	..	1	..	..	2	2	2	2	4	4	5	5	..	..	..	..	4	4	2	2	..
Florida	25	26	—1	20	21	1	2	1	1	1	..	4	4	18	19	22	23	22	24	1	..	..	..	22	20	23	21	..
Georgia	64	68	—4	59	56	1	2	..	1	..	..	5	3	29	16	34	19	31	27	..	..	..	..	43	43	45	46	..
Idaho	6	7	—1	6	7	..	..	..	..	..	..	..	..	6	7	6	7	5	6	..	..	..	..	2	7	3	6	..
Illinois	386	392	—6	227	226	18	22	11	11	21	19	106	105	72	78	178	183	157	156	15	11	13	13	223	225	256	243	1
Indiana	206	220	—14	133	128	9	10	5	5	10	9	52	51	45	45	97	96	90	93	5	..	4	..	115	117	134	134	3
Iowa	85	86	—1	64	65	4	1	3	1	2	3	13	9	23	24	36	33	38	38	1	..	1	..	120	56	120	57	..
Kansas	51	48	+3	42	42	1	1	1	1	..	..	7	7	24	23	31	30	24	28	3	..	..	..	35	37	35	35	..
Kentucky	41	43	—2	31	31	..	..	..	..	..	..	5	12	13	11	18	23	12	14	1	..	..	..	27	27	24	22	..
Louisiana	29	31	—2	25	26	4	4	3	3	..	..	3	4	16	18	19	22	12	12	..	..	..	..	19	20	19	17	..
Maine	28	28	..	26	26	..	1	..	..	..	..	2	2	18	20	20	22	16	19	..	..	..	..	18	19	21	22	..
Maryland	55	53	+2	39	39	..	1	..	..	1	1	15	13	18	18	33	31	20	22	..	..	1	..	34	33	30	25	..
Massachusetts	210	225	—15	121	125	9	12	7	4	2	3	78	84	41	42	119	126	103	112	3	..	1	..	97	100	101	100	3
Michigan	324	327	—3	190	189	18	18	15	12	11	11	96	106	64	66	160	172	123	133	11	5	9	8	192	197	194	180	4
Minnesota	95	102	—7	68	73	4	4	3	3	1	1	23	24	24	30	47	54	33	39	5	2	1	1	58	63	49	55	..
Mississippi	15	18	—3	14	15	..	..	..	..	..	..	1	1	9	11	10	12	4	4	..	2	..	1	15	14	6	7	..
Missouri	111	109	+2	69	63	8	7	6	3	3	2	27	30	11	14	38	44	43	43	5	3	2	2	61	65	73	74	1
Montana	8	8	..	8	8	..	..	..	..	..	..	..	..	7	7	7	7	3	2	2	1	..	..	8	8	7	7	..
Nebraska	25	28	—3	20	21	1	1	1	1	..	..	2	4	13	12	15	16	15	18	..	1	..	..	19	19	19	18	..
Nevada	7	6	+1	6	5	2	2	1	2	..	..	1	1	5	5	6	6	5	5	..	..	..	..	6	6	5	5	..
New Hampshire	28	31	—3	18	19	2	2	1	1	1	1	9	9	11	10	20	19	13	15	..	..	..	..	15	13	13	11	..
New Jersey	184	194	—10	101	96	5	5	3	3	3	3	73	68	26	27	99	95	87	79	3	..	3	1	99	93	103	96	4
New Mexico	1	1	..	1	1	..	..	..	..	..	..	..	..	1	1	1	1	1	1	..	..	..	..	1	1	1	1	..
New York	416	432	—16	240	255	15	16	13	11	15	13	125	132	103	101	228	233	182	185	8	6	8	10	237	254	242	249	2
North Carolina	62	57	+5	57	54	..	..	..	..	..	..	2	3	40	38	42	41	36	34	1	..	1	1	39	37	42	37	..
North Dakota	4	4	..	3	3	..	..	..	..	..	..	1	1	1	1	2	2	1	1	..	..	..	..	4	4	4	4	..
Ohio	533	555	—22	302	400	31	31	25	26	19	23	165	157	71	69	236	226	216	207	26	19	11	19	324	322	318	316	3
Oklahoma	38	36	+2	25	28	1	1	1	1	..	..	10	7	12	14	22	21	24	21	1	..	..	..	26	24	27	26	..
Oregon	44	46	—2	33	35	3	2	3	2	..	..	7	8	17	18	24	26	23	23	..	..	1	1	24	26	24	23	..
Pennsylvania	591	610	—19	388	401	59	67	28	30	18	19	194	137	145	156	279	293	220	221	12	4	12	12	399	431	400	419	3
Rhode Island	35	36	—1	16	15	..	..	..	..	1	1	18	18	8	8	26	26	21	21	..	..	..	..	15	15	15	15	..
South Carolina	20	23	—3	19	23	1	2	..	..	..	1	14	..	21	16	35	16	1	13	1	..	..	..	13	14	12	13	..
South Dakota	3	3	..	3	3	..	..	..	..	..	..	..	..	2	2	2	2	2	2	1	..	..	..	3	3	3	3	..
Tennessee	72	74	—2	60	61	2	1	1	1	..	1	8	9	26	27	34	36	24	26	1	3	..	1	53	49	54	52	..
Texas	79	83	—4	60	69	7	6	5	5	..	..	15	16	34	31	49	47	37	43	2	1	..	..	56	57	58	58	..
Utah	17	20	—3	15	17	1	2	1	1	..	..	2	3	10	10	12	13	10	11	..	..	..	..	10	10	11	11	..
Vermont	22	22	..	18	19	..	..	..	..	..	..	4	3	11	11	15	14	10	7	..	..	..	..	13	14	14	15	..
Virginia	68	72	—4	66	69	3	4	3	3	2	1	36	3	1	37	37	40	33	37	4	1	1	1	44	43	43	42	1
Washington	86	78	+8	61	56	13	15	13	14	1	..	18	15	38	33	56	51	49	50	2	..	..	..	35	37	46	45	..
West Virginia	43	49	—6	31	38	2	4	2	3	1	1	9	9	16	22	25	31	16	18	2	1	1	1	31	34	34	37	..
Wisconsin	289	227	+62	124	130	15	16	13	14	12	16	53	53	45	29	98	82	89	97	6	2	7	4	126	132	124	131	2
Wyoming	2	3	—1	2	3	..	..	..	..	..	..	..	..	2	3	2	3	2	3	..	..	..	..	2	2	2	3	..
Total	5001	5073	—72	3070	3208	283	316	205	204	138	147	1311	1277	1224	1292	2535	2569	2112	2157	140	77	90	85	3015	3021	3076	3010	30
Alberta	13	13	..	11	12	2	2	2	2	..	1	2	1	10	11	12	12	10	9	..	..	..	1	12	11	11	11	..
British Columbia	42	42	..	35	33	6	4	6	4	1	..	7	8	27	23	34	31	28	26	..	1	..	..	30	25	30	30	..
Manitoba	15	13	+2	8	9	3	2	2	2	..	..	5	3	1	2	6	5	7	5	1	1	..	..	9	11	9	10	..
New Brunswick	11	13	—2	10	12	..	..	..	..	..	..	1	1	8	8	9	9	4	6	..	..	..	..	8	10	8	10	..
Newfoundland	3	3	..	3	3	1	..	1	..	..	..	..	..	3	3	3	3	3	3	..	..	..	..	3	3	3	3	..
Nova Scotia	18	22	—4	16	20	2	2	1	1	..	..	1	1	13	17	14	18	6	9	1	1	..	..	15	17	14	18	..
Ontario	264	263	+1	202	200	5	5	4	3	10	10	49	49	97	95	146	144	170	115	4	3	6	4	197	193	161	176	..
Prince Edward Island	3	3	..	3	3	..	..	..	..	..	..	..	..	3	2	3	2	1	..	..	..	..	..	3	3	1	2	..
Quebec	89	85	—6	63	70	9	9	7	8	1	1	16	15	39	41	55	56	52	55	6	3	1	2	64	74	65	75	..
Saskatchewan	5	3	+2	5	3	..	..	..	..	..	..	..	1	5	5	5	5	4	3	..	..	..	..	4	4	5	5	..
Total	463	470	—7	356	365	28	24	23	20	12	12	81	79	236	207	287	286	285	231	12	9	7	7	345	351	307	340	..
Total in U. S. and Canada	5464	5543	—79	3426	3573	311	340	228	224	150	159	1392	1356	1430	1499	2822	2855	2397	2388	152	86	97	92	3360	3372	3383	3320	30



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MOLY

Avalanche lands at the door

The Adventures of Bill

—by Pat Dwyer

AT ONE time or another when I have had nothing else to do I have speculated idly on why the grist of incoming mail is greater in summer than in winter, or now that I come to think of it, at any other season of the year. Considering the heat and the humidity and one thing and another, one might be justified, might one not, in assuming that the letter writing bug or bacillus or germ or whatever it is would seek refuge from the heat in some deep dark cavern. Conversely, an opinion based on the same premises would indicate increased activity of this virulent microbe in the bracing atmosphere of the spring, fall and winter.

Probably the authors of our best sellers *Are You a Man or a Mouse*, *Why Be a Fifth Wheel*, *Come Out of Your Snail Shell*, *Yoo-Hoo Dumb-bell*, probably the authors of these sterling pieces of literature have analyzed the situation and could supply me with the answer. Unfortunately, I should have to write at least one and perhaps several letters to pry this information loose. I don't want my worst enemy—pooie from me to him in the meantime—I don't want my worst enemy to rise up and jeer at my lack of consistency in committing an act which I so freely condemn in others. Definitely, that's out.

Side tracking for the moment the broad general aspects of the case, let us consider briefly a typical instance of this tendency to seize the trusty quill or pencil, spill the burning words on paper, encourage the government to issue more and gaudier stamps, and give Jim Farley an excuse to point with justifiable pride to a steadily rising efficiency curve except possibly in the two extreme northeast states where tradition keeps alive the memory of a famous stamp act.

About a month ago on this page I commented briefly on the phenomenal growth of grass—a more accurate term would be hay, weeds and dandelions—on the lawn and the almost superhuman effort required on my part to nip this jungle down to a reasonable height. Left to myself I never would have touched it. Planting grass seed, encouraging it in every way to grow, and then cutting it down to the quick every week end, appeals to my sensible and orderly mind as the height of something or other. However, long experience has convinced me of the futility of pitting even the most sensible argument against the most immovable of all immovable objects, indulgently referred to as a woman's whim. Did I get anywhere when I suggested laying down a concrete blanket over the entire area and painting it green? Here was a practical, common sense and permanent solution to the problem. Offered as a resolution, it was killed as dead as Pontius Pilate's billy goat, before it was even seconded.

Missed him again, by Heck

Gross exaggeration bare facedly was employed to bolster up some of the flimsy grass cutting claims. How would I like, I was asked, how would I like to come home some night and find that the youngest member of the tribe who modestly admits on the slightest provocation that he is 3 years old and afraid of nothing, how would I like, they insisted, if I found that this precious little cherub with his bow and arrow had wandered into the jungle in the early morning and no hair nor hide had been seen of him since. How would I like that, hey?

Piffle, of course, the pure unadulterated quill, but—well, the grass is cut every Saturday—by deputy. Through a most remarkable stroke of good fortune, a gallant young lad who lives down the street some place happened to see me struggling and gasping with the lawn mower. He bears a strong resemblance to what's his name Blessings on thee little man, Barefoot boy with Cheeks of Tan. Blessings is the word. For the modest stipend or honorarium of one dollar cash in hand well and truly paid he gallops over the lawn like a blinkin' gazelle and mows it down as slick and smooth as a horse coming out from under the clippers. After the job is done, I occasionally point to it with proper house holder's pride.

Following the publication of my brief comment on this subject I have been deluged with letters from admirers and critics, with the former, I am happy to say in the vast majority. Accurate count up to the

(*Continued on page* 53)

ADVERTISING PAGES REMOVED

(*Continued from page* 50)

present, with several outlying precincts yet to be heard from, show a grand total of two (2) warmly supporting my views and one (1) distinctly hostile.

This snake in the manger or dog in the bush, who signs himself *Comrade* claims that I make him sick with by weasely excuses for avoiding a little honest work. "The trouble with birds like you," the comrade continues, "is that you are long on gab and short on"—your pardon for not setting down the rude and alliterative term—"and you brazenly exploit child labor. Why don't you go back to where you came from and eat the grass with your other four footed relatives." Distinctly the comrade was quite annoyed.

However, as I say, the majority of the letters—by actual count 2 to 1—were commendatory and complimentary to a gratifying extent. One who signed himself *In the Dog House* wrote: "Keep up the good work, kid. Don't let 'em put anything over on you. For some time, under protest y'understand, under protest I been walking the dog at night. I ain't saying nothing, see? but one of these nights the yappy, hairy little puff ball is going to vanish. I got a man hole spotted where the street crew is doing some repairs. The good old alibi is all worked out and rehearsed. Hot dog!"

The remainder of the deluge of letters (1) while warmly commending my course of action, carried a mildly yearning or pessimistic note. "Since I am in a somewhat similar position to your's," this citizen wrote, "I cannot resist the temptation to present heartiest congratulations, first, on your attitude toward the entire problem and the ingenious alternative solution, and second on your extraordinary luck in snaring or otherwise capturing a young deputy to do the dirty work for you. Out here where I live the boy crop has been dwindling steadily for several years. Only a few specimens in the entire neighborhood and they are as shy and wild as hawks. They practically live in automobiles and at the first hint of tackling a job of any kind they disappear in a cloud of dust, like them what - do - you - call - 'em things that live in the sea and squirt a bag of ink in the water when they are annoyed. I have set dead falls, snares and spring poles baited with brand new dollar bills, but with truly devilish ingenuity and a high degree of low animal cunning, they manage to evade them all. I have considered the advisability of catching one of them on the wing with a load of bird shot, but reluctantly have been forced to abandon the idea. In the first place it would be just my luck to have him flutter away into the weeds where I could not find him. In the second place if I caught him and put him to work the venomous little creature either would sue me for damages or stage a sit down strike. I give up."

As I said in the beginning I often have wondered why the volume of mail is greatest in summer, when presumably the old engine barely is turning over or at best with the indicator showing Slow or ¼ Speed. Whatever the reason, a host of people—see exhibit *A*, *B* and *C*—saw fit to comment on my lawn mowing experience. Before I emerged from under the avalanche the post man dumped another letter on the pile. This letter was from the manager of a foundry south of the Mason and Dixon line. He craved information, Suh, on a little knotty—no, no, not naughty—a little knotty problem in connection with the liquid shrinkage of iron.

"Has that Irishman Bill," he wrote, "who seems to have a lot of good foundry sense, ever written anything on the subject "Liquid Shrinkage of Iron?"

"I have looked in vain for information on this subject, but up to the present without success. I would welcome a note from Bill on the subject as I seem to have quite a time impressing on our man in charge the importance of gates and risers, even though I have purchased a book by that name written by yourself. It tells ways, to be sure, how to properly gate and riser castings, but I want to show my man just what it amounts to in cubic inches to the 100 pounds which I believe will make an impressioin on him.

"If you will broach this subject to Bill some day in the near future when he seems to be in good humor, and I take it in things I have read from his pen, that true to the Irish strain, he is perpetually in that mood, I will be obliged to you, or youall, as they put it down this way."

I turned the letter over to Bill and a few days later he showed me the following carbon copy of his reply:

"Several years ago I had the pleasure of visiting the dean of foundrymen in your town. I noted with respect and admiration, and maybe a small tinge of envy, the feudal atmosphere of the office. Before leaving for lunch his colored personal attendant oozed into the room, and without a word being said, carefully dusted off Ol' Massa and shined his shoes. Then he preceded us down the stairs and took his place at the wheel of a palatial motor car.

"Naturally I assumed that all foundry managers in the South live the life of Reilly.

"Living the life of Reilly infers a certain amount of leisure and consequent opportunity for the Evil One to get in a few good licks, or as the old hymn has it—I am quoting from a somewhat moth eaten memory—'Satan still finds lots of work for idle hands to do.'

"Sitting there in your deeply upholstered chair, idly blowing smoke rings and waiting for the faithful blackamoor to bring in another tall, frosted one, your conscience whispers: 'Hey, fella, how about that dope on liquid shrinkage of iron you were going to investigate one of these days?'

"Here's where the old boy with the forked tail and the cloven hoofs does his stuff.

(*Concluded on page* 68)

You know who finds lots of work for idle hands to do

International Congress Discusses Testing

THE International Association for Testing Materials held its congress in London from April 19 to 24. Subjects discussed were divided into four groups: Group A, Metals, with Prof. C. Benedicks, Sweden, as president, and Dr. H. J. Gough, England, as vice president. Group B, Inorganic Materials, with Prof. E. Suenson, Denmark, as president and Direktor P. F. Van Der Wallen, Holland, as vice president. Group C, Organic Materials, with Dr. Ing. R. Barta, Czechoslovakia, as president and Prof. J. O. Roos-Af-Hjelmsater, Sweden, as vice president. Group D, Subjects of General Importance, with Prof. H. Rabozee, Belgium as president, and Prof. Dr. Ing. M. Ros, Switzerland, as vice president.

Relation of Tests

The first technical session was held April 19 and was devoted to the discussion of papers on Relation Between Results of Laboratory Tests and Behavior in Use and Service, which included nine papers; and Bearing of Recent Advances in Physics and Chemistry on Knowledge of Materials, which included eight papers.

In the first group, one paper was of special interest to steelmakers. It was entitled "Laboratory Tests in Relation to Serviceability of Steel and Steel Products," by Sir Robert A. Hadfield and S. A. Main of Hadfields Ltd., Sheffield, in which the authors state that the only fully satisfactory basis for successful service is actual experience in service of a similar kind. Other papers dealing with the relation between laboratory test results and behavior and use in service of materials in general were contributed by research workers from several countries including Austria, Czechoslovakia, Germany, Roumania and Switzerland.

All groups of papers were dealt with on April 20. Study of metals was covered under Group A, and the morning was devoted to the section dealing with the progress of metallography. The first three papers presented for discussion dealt with preparation and surface treatment of test pieces. Dr. Ing. M. Niessner, Vienna, contributed a paper entitled "Microchemical Research on the Surface of Metallic Materials." W. H. Dearden, University of Bristol, England, contributed a paper entitled "The Preparation of Specimens for Macro and Micro Examination."

Two other papers followed dealing with the subject of microscopy and included a contribution by Prof. Dr. Koster, Kaiser Wilhelm Institute fur Metallforschung, Stuttgart, on "Progress in Microscopic Research on Metals," and one by Dr. F. F. Lucas, Bell Telephone Laboratories Inc., New York, entitled "Progress in Microscopy."

In the discussion that followed, Prof. Benedicks said that he did not quite agree with a statement by Dr. Koster that we apparently had advanced as far as theory would permit relative to the limit of magnification obtainable in microscopic examinations. Dr. C. H. Desch, National Physical Laboratory, Teddington, referring to Dr. Lucas' paper stated that the author had shown that small particles of carbide now were observable in a way that would not have been thought possible by the old theories.

Methods Deserve Attention

Prof. A. Skapski, Cracow, Poland, contributed a paper entitled "Electrolytic Extraction of Nonmetallic Inclusions in Iron and Steel," covering both qualitative and quantitative analysis. In his conclusions, the author states that he believes that electrolytic methods and particularly the citrate method, deserve attention and promise further development. Another in the group was by Helge Lofquist, Stockholm, on "Progress of Knowledge on Slag Inclusions."

In the discussion Dr. T. Swinden, United Steel Companies Ltd., Sheffield, said that it is not yet possible by mechanical methods to study individually the mineral constituents of inclusions in steel. He mentioned that sulphides and phosphides interfere with results of the iodine-alcoholic method. He also stated that the problem must be looked upon in two ways: (1) Determination of the inclusions and (2) Determination of the oxygen in steel in such a manner that it can be used by the steelmaker.

The metal group again was discussed on April 21, with subgroup 1: "Behavior of Metals (Mechanical and Chemical) As Dependent Upon Temperature, Particularly in Regard to High Temperature." Prof. Benedicks was in the chair, supported by Dr. Hatfield and Prof. Skapski.

Under "Mechanical Properties" three papers dealt with the subject of creep in general. In the first paper on "The Phenomenon of Creep Recovery" by H. J. Tapsell of the National Physical Laboratory, Teddington, it was explained that when a load is removed from a metal under stress, the elastic stress is recovered almost immediately, and part of the creep also is recovered. If the load only partially is removed, creep sets in again after a partial recovery. Recovery of creep may go on for thousands of hours.

Drs. C. L. Clark and A. E. White of the University of Michigan, Ann Arbor, Mich., contributed a paper entitled "The Mechanism of the Creep of Metals," and A. Nadai, Westinghouse Electric & Mfg. Co., East Pittsburgh, gave a paper on "Creep of Metals." In the discussioin, Dr. R. W. Bailey, Metropolitan-Vickers Electrical Co. Ltd., Manchester, said that it is doubtful if study of creep recovery will help greatly to unravel the actual process of creep. He did not agree with Drs. Clark and White that carbides have the amount of influence on the stiffening of steel which they stated in their paper. Prof. Benedicks considered that discovery of creep recovery was an important point, and suggested that surface tension might be a cause of contraction of steel after stress had been removed. Dr. Jenkins and Dr. Hatfield both expressed the opinion that the phenomenon of creep is due mainly to recrystallization.

Discuss Creep Testing Methods

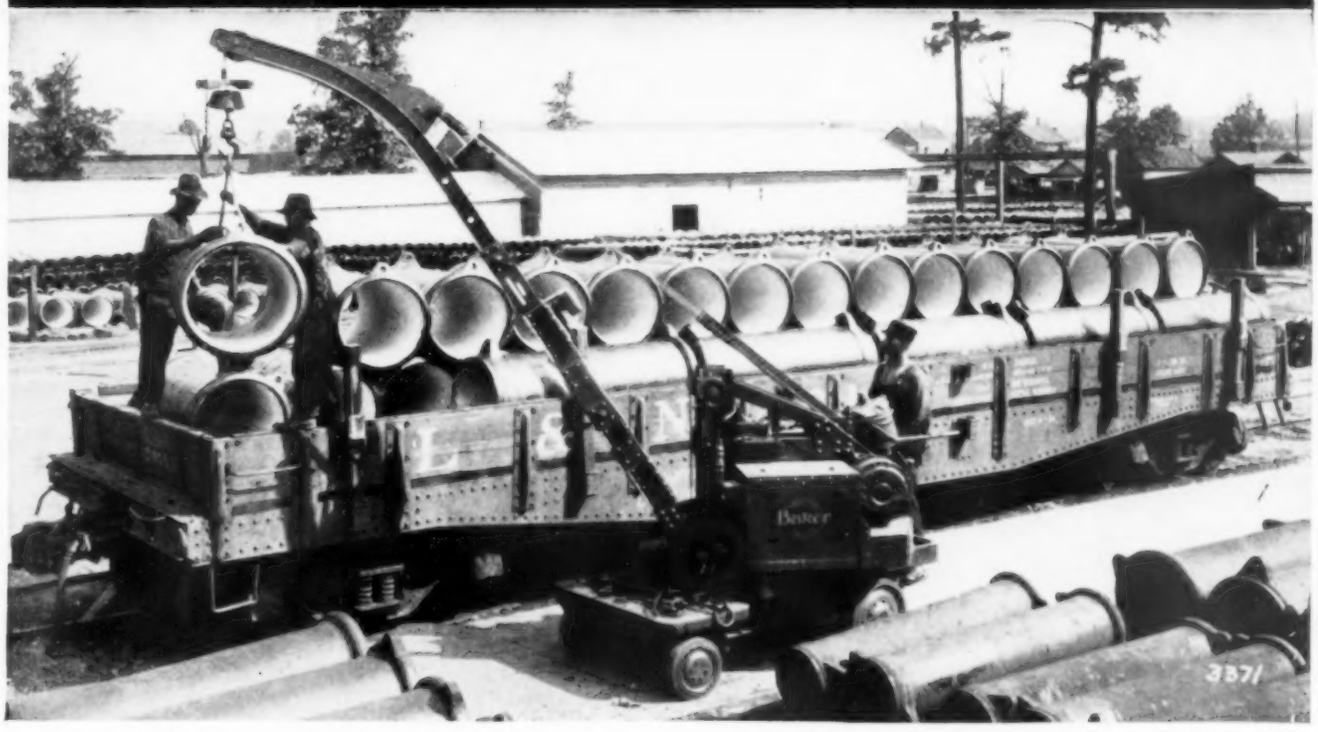
Four papers were devoted to the discussion of creep testing methods. L. Gottignies, University of Brussels, contributed a paper on "The Resistance of Plastic Deformations of Steels Under Stress at High Temperatures." He pointed out that in the paper mention was made of the relative resistance of cast steel to forged steel in the case of carbon steels, and that the temperatures concerned were under 475 degrees Cent. He emphasized the importance of the question of length or duration of the tests in arriving at conclusive results.

A paper entitled "Interpretation and Use of Creep Results" was contributed by J. J. Kanter, Crane Co., Chicago, and one "Effect of Temperature on the Properties of Steels," by C. E. MacQuigg, Union Carbide and Carbon Research Laboratories, New York, also was presented.

In the discussion, Dr. Rohn stated that behavior of metals changes at the point of recrystallization, and that most of the research work has been done at temperatures below that point. Prof. Portevin emphasized the point made by Dr. Rohn,

(*Concluded on page 56*)

Delicate Cores or HEAVY CASTINGS



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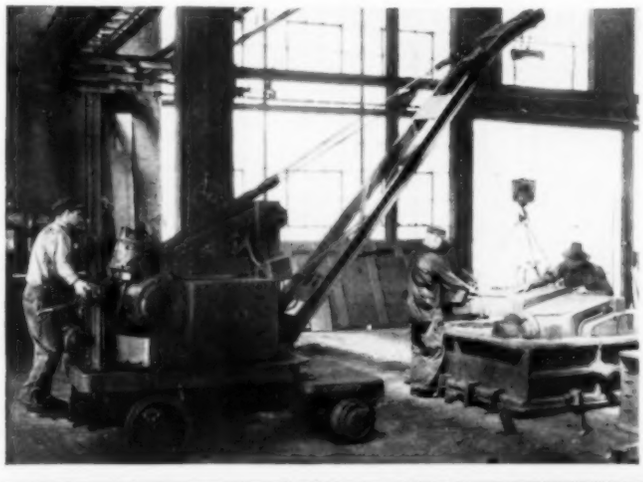

RUGGEDLY built to stand the gaff of jobs which require constant heavy-duty service . . . yet so accurately controllable that delicate cores can be set in place without breakage . . . BAKER Crane Trucks are the "Handy Andies" of foundry operation, popular with men and management wherever used. Indoors and out Baker Cranes travel speedily from job to job, always in demand and always saving time and money on both routine and emergency work.

Capacities, 3,000 to 10,000 lbs. at 5 to 8 ft. Telescoping or rigid booms furnished up to 20 ft. in length. Hoisting, slewing and topping motions independently controlled from operator's position.

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BAKER INDUSTRIAL TRUCK DIVISION
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The most economical way to handle material is NOT to HANDle it

(*Concluded from page* 54)

particularly as regards the distinction between the recovery of the lattice and recrystallization.

Following a contribution by Prof. Dr. A. Krupkowski of the Mines Academy, Cracow, Poland, on "The Rate of Oxidation of Liquid Metals," Prof. Portevin drew attention to the practical interest of that paper, especially as regards the foundry and autogenous welding. He explained that when oxides are insoluble in metal they cause difficulties in casting, and he cited the case of aluminum, where the difficulty is still greater in regard to welding. A skin of alumina forms itself, the strength of which is quite important, and this skin has an influence on the surface tension of the molten metal. Such oxide skins can be done away by the use of fluxes, but if they penetrate inside the metal, they will cause a crack. On the other hand, such oxide skins are sometimes used deliberately to protect the liquid metal against further oxidation, and for that purpose aluminum is used in small quantities in the melting of copper and silver.

Plans Conferences At Universities

The American Foundrymen's association, in co-operation with several chapters and universities, has scheduled three regional meetings and one mid-year technical meeting for the Fall season.

The first will be the midyear technical sessions to be held at Columbus, Sept. 30 and Oct. 1, under the co-operation of the Battelle Memorial institute and A. F. A. The meeting will be devoted exclusively to a thorough discussion of a few outstanding technical problems relating to steel, nonferrous and gray iron foundries. Conference leaders will be chosen from the foremost foundry technologists. Those attending will have the opportunity to inspect the institute's new foundry research laboratory, a building given over entirely to the study of foundry metals and processes. Dr. C. H. Lorig and C. E. Sims, of the institute staff, are in charge of the program for the meeting.

The first regional conference of the year will be held Oct. 8 and 9 at Missouri School of Mines, Rolla, Mo., under the joint auspices of the American Foundrymen's association, St. Louis District Chapter of the A. F. A. and the university. A tentative program includes sessions on sands, refractories, metallography, nonferrous castings, gray and alloy irons. A dinner and luncheon also are scheduled. H. Bornstein, Deere & Co., Moline, Ill., president-elect of A. F. A., is scheduled as the dinner speaker.

Another regional meeting is proposed for Cornell university, Ithaca, N. Y., to be held under the joint auspices of A. F. A., the Buffalo chapter and the university. This meeting probably will be held the latter part of November. At present, the university is working on a tentative program.

A Second Annual Iowa conference also will be held in conjunction with the Quad City chapter and one of the state universities. As yet no date has been set and details will be available later.

New England Group Considers Welding

P. J. Horgan, fabricating engineer, General Electric Co. and Mr. Bourque, superintendent of the fabricating department of the G. E. company, Lynn, Mass., spoke at the June 9 meeting of the New England Foundrymen's association on the subject "When to Weld—When to Cast—or Both."

Mr. Horgan explained how large castings are built up by welding and illustrated his various points with a large number of interesting slides. He endeavored to explain the reason for this different trend of thought, that is, the building up of castings as compared to a single casting. Mr. Bourque supplemented the talk and explained some of the details of manufacture.

Considerable discussion followed the formal presentation. Walter M. Saunders Jr., president of the association, presided.

Opens Sales Office

Ajax Flexible Coupling Co., Westfield, N. Y., has opened sales offices in Akron, O., Kansas City, Mo., and Seattle. Beese & Terry will represent the company in Akron; Arthur D. Schwartz will cover the Kansas City territory, and W. F. Nichols will serve the area around Seattle.

General Engineering Equipment Co., 578 Century building, Indianapolis, has been appointed representatives in the Indianapolis district of the Pennsylvania Pump & Compressor Co., Easton, Pa.

Northeastern Ohio Chapter Holds Annual Outing

Candid camera shots of some participants in the festivities which took place at Lake Forest Country club, Hudson O., June 26

Golf and a baseball game between foundrymen and vendors preceded the 7 o'clock dinner at which nearly 200 were present

Englishman Visits In America

R. T. Ankers, member of the board of directors, Tilghman's Patented Sand Blast Co. Ltd., Broadheath, near Manchester, England, recently was in the United States and visited foundries throughout the entire country. Before returning to England, Mr. Ankers made several interesting observations on American and European practice as follows:

"I am particularly impressed by the attention which is given to detail by American foundrymen. Due to the fact that I spend a considerable portion of my time in the found-

R. T. Ankers

ries of England, France and Germany, I feel qualified to state that the United States is far in advance of any European country in this respect, and are undoubtedly benefiting greatly from it. The American method of skin drying molds produces a fine finish to casting faces. Another method used over here which particularly impressed me was the intermittent use of oil fired burners to allow vapors to evaporate between heats. American conveying systems top anything which Europe has to offer."

"Major developments are being made in English foundry methods. High production methods, factory modernization and labor saving equipment rapidly are gaining favor in England. One innovation has been the introduction of the wheelabrator method of cleaning castings. English foundries seem to be busier than those in America due chiefly to improved trade conditions and the gigantic armament program. These unusually busy conditions are causing concern to English manufacturers as a shortage of both pig iron and scrap is developing which may prove rather difficult in time. There have been no major strikes in England. America should adopt some system of collective bargaining similar to that used in England."

Mr. Ankers also expressed appreciation to those who had given information and helped make his stay in America most pleasant.

Acquires Plant for Briquetting Scrap

Nu-Scrap Briquetting Co., Milwaukee, recently has acquired the commercial briquetting plant established at 219 South Sixteenth street, Milwaukee, last October by the Milwaukee Foundry Equipment Co. The company at present is briquetting only cast iron borings, but later the firm intends to install a crusher and to enlarge its scope by briquetting machine shop turnings.

Cast iron borings are purchased by the company on the open market from machine shops and the briquets are sold to local foundries. The company takes about 30 to 40 samples at random from each incoming carload of borings to secure a representative analysis so that foundries are able to purchase briquets of a known analysis. It is pointed out that by handling the material in this manner, the foundry is permitted to obtain a closer metal control. The borings are screened before they are briquetted, and therefore the resulting product is free from foreign materials and is claimed to contain no burnt or unmachinable iron. The briquets are of sufficient density to permit trucking and handling into the melting zone without crumbling. Foundries in the district using these briquets are said to be increasing gradually the total amount used in each charge. These plants report that the melting loss of briquets is less than the average with the general run of scrap, attributable to the fact that the briquets are uniform in size, that they have no tendency to bridge in the cupola or fuse together as they melt.

The company points out that salvaging borings in this manner really conserves a basic metal in an economical method, as about 96 to 97 per cent of the material is returned into good metal without the expense of shipment and handling to the blast furnace.

Discusses Vanadium Steels and Irons

Vanadium Corp. of America, New York, has published an interesting and valuable book entitled, "Vanadium Steels and Iron." The book is written for metallurgists, designing engineers and others interested in the production, fabrication and use of metals. It contains 189 pages, and is divided into eight chapters. The first chapter discusses the function of vanadium in steels, and the second describes wrought constructional vanadium steels in light sections. Chapter III deals with wrought constructional vanadium steels in heavy sections while Chapter IV relates to vanadium spring steels. Vanadium Cast steels is the subject of the fifth chapter, and vanadium tool steels are discussed in the sixth.

Chapter VII relates to vanadium nitriding steels while Chapter VIII deals with vanadium cast irons. The book presents authentic and concise information concerning the properties of steels and irons alloyed with vanadium, and the data and descriptive matter include those from recent tests. Each chapter includes a bibliography, and the book has an excellent index.

Leading Foundry Cities

Standing	City	Total Foundries 1937	1935
1	Chicago	163	158
2	Los Angeles	115	99
3	Cleveland	113	113
4	New York	100	101
5	Detroit	94	93
6	Milwaukee and West Allis	82	85
7	Philadelphia	76	78
8	Boston (Greater Boston)	59	55
9	St. Louis	58	52
10	Cincinnati	55	53
11	Buffalo	51	50
12	Toronto, Ont.	47	47
13	Pittsburgh	43	41
14	Baltimore	41	35
15	Minneapolis	37	36
16	Seattle	37	33
17	Newark, N. J.	35	37
18	Montreal, Que.	35	29
19	Columbus, O.	34	34
20	Indianapolis	33	29
21	Erie, Pa.	32	30
22	Denver	31	28
23	Birmingham, Ala.	30	34
24	Dayton, O.	30	30
25	Reading, Pa.	29	27
26	San Francisco	27	27
27	Toledo	27	27
28	Portland, Oreg.	27	27
29	Louisville, Ky.	26	26
30	Chattanooga	24	25
31	Kansas City	24	24
32	Rochester, N. Y.	23	24
33	Syracuse, N. Y.	22	26
34	Oakland, Calif.	21	21
35	Springfield, O.	21	22
36	Bridgeport, Conn.	20	20
37	Vancouver, B. C.	20	20
38	Grand Rapids	19	21
39	Worcester, Mass.	18	20
40	St. Paul, Minn.	18	20
41	Moline, Ill.	18	18
42	Racine, Wis.	18	18
43	Houston, Tex.	18	15
44	Rockford, Ill.	17	18
45	Atlanta, Ga.	17	18
46	Canton, O.	16	16
47	Elkhart, Ind.	15	15

Bureau of mines, Washington, recently published one of its progress reports from the metallurgical division on thermodynamic studies. The present report No. R. I. 3341, gives the calculation of specific heats and entropies of metal vapors from spectroscopic data with special reference to gaseous iron and copper.

VIEWING FOUNDRY DEVELOPMENTS AT SHORT RANGE

INVESTIGATION carried out by the Association of German Foundrymen has resulted in a method for preventing nails, chaplets and other metal inserts from causing blowholes in the castings. Tin is not available in Germany for this purpose. In the new method the parts are not coated with any material. They are pickled in hydrochloric acid and washed with gasoline or ammonium chloride solution. In some instances the parts are coated with a thin layer of cadmium, cadmium copper, or copper applied electrically after the parts have been pickled and descaled.

* * *

A recent patent describes a pearlitic malleable cast iron which is formed by adding 0.50 *to* 1.0 *per cent manganese,* 0.20 *to* 0.60 *per cent molybdenum,* 0.10 *to* 0.60 *per cent chromium, and* 0.10 *to* 0.60 *per cent vanadium to regular malleable iron. The product is heat treated in the regular way, and again heated to* 1375 *to* 1500 *degrees Fahr.; quenched in air oil or water, and reheated to* 900 *to* 1350 *degrees Fahr. The resultant structure shows pearlite surrounding temper carbon and grain boundaries penetrating into ferrite grains.*

* * *

A recent patent describes a composition for and heat treatment of cast steel plungers for glassworking machines which is claimed to give excellent results. The composition is given as 0.09 per cent carbon, 1 per cent molybdenum, 3.5 per cent nickel, 1 per cent silicon, 12 per cent chromium, and 0.5 per cent titanium. As cast the alloy steel has a brinell hardness of 250 and is machinable. It is machined allowing only a grinding finish, and then heated to 1750 degrees Fahr. from 1 to 4 hours. It is cooled slowly in the furnace, and has a brinell ranging from 500 to 550.

* * *

Stearic acid, because it has shrinkage characteristics similar to aluminum bronze and steel, is recommended as an easily handled material to determine experimentally the effects of various types of gates and risers on a given casting.

* * *

CYLINDER liners for diesel engines built by a West Coast manufacturer are made from a nickel-chromium cast iron which averages 3.00 per cent total carbon, 1.65 per cent silicon, 0.75 per cent manganese, 1.50 per cent nickel, and 0.30 per cent chromium.

* * *

Difficulty from corners drying out in certain types of molds has been overcome by spraying lightly with crude oil.

* * *

A superdeoxidizer for ferrous and nonferrous metals is composed of 10 to 50 per cent lime, 35 to 75 per cent silicon, 0.5 to 25 per cent aluminum, 0.50 to 10 per cent carbon, 0.00001 to 10 per cent sodium bichromate, 0.00001 to 10 per cent ammonia, and 5 per cent maximum iron, according to a recent patent. One composition used contained 9 pounds of a mixture comprised of 40 per cent lime, 53 per cent silicon, 3.5 per cent carbon, and 3.5 per cent iron to which was added just before use 1½ pounds of aluminum, ½ ounce of sodium bichromate, and 3 to 4 cubic centimeters of ammonia. The patent claims that the deoxidizer removes solid non-metallic inclusions, metalloids, gases, etc.

A new liquid material recently has been developed for application to concrete floors to fill the surface pores and to supply a smooth nondusting surface. It is claimed to constitute a tough, wear resisting binder for the surface of the concrete, is waterproof, and will not stain or absorb oil or grease.

* * *

A new development described in a patent involves the use of a facing of copper powder on the mold for preventing microchill on enameling cast iron, and aiding in the machining of cylinder blocks. The coating may be comprised of metallic copper powder, copper alloy powder, or finely granulated cuprous and cupric oxides. Application is by dusting or more preferably by spraying. The powder under 50*-mesh size is suspended in water containing* 2 *per cent bentonite clay and* 5 *per cent molasses.*

* * *

A new flux has been developed for hard soldering, brazing and welding on stainless steel, iron, copper, brass, bronze, monel metal, nickel, etc. It is said to act as a solvent for metal oxides, and spreads over the surface of the work to exclude air while the soldering operation is being performed. Fluxing action starts at 212 degrees Fahr. There is a flow point at 785 degrees Fahr., and continued flow without undue vaporization to 1600 degrees Fahr. It is claimed that there is no harmful toxic action, and the excess material can be washed off with hot water.

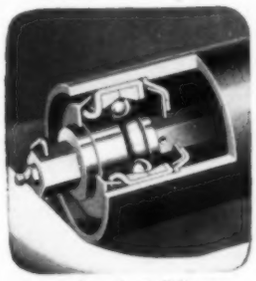
* * *

A recently patented solder for aluminum plates has the following composition: Tin, 60 per cent; cadmium, 25 per cent; silver, 7.5 per cent, and aluminum, 7.5 per cent.

★ *Doing it the modern, economical way – in the cleaning room of a foundry making malleable castings. Castings in tote pans are delivered by transfer car to any desired cleaning and inspection table, the finished castings being removed in the same way.*

The modernized plant has "THE EDGE"

REGARDLESS of the size or scope of your foundry operations—you can *get the edge on competition*—by *keeping up-to-date* with your equipment. . . . And in no phase of foundry operation today is there greater room for profitable progress than in *materials handling*. . . . Along production lines in many up-to-date foundries Logan Conveyors are effecting economies in time, effort and space, making savings that could not otherwise be enjoyed. For the handling of flasks, castings and tote pans through virtually every operation — conveyors are the modern solution. . . . For details, talk to the nearest Logan engineer, or write on your letterhead, for the new Logan Foundry Bulletin.



Logan Foundry Roll bearing has all-steel seals, revolves as freely as plain bearing because it has no felt washers.

LOGAN CO., Incorporated, Louisville, Ky.
580 Buchanan St.

HELP YOU GET OUT THE WORK

Logan Conveyors

LOUISVILLE

- Large and Small Castings

(*Concluded from page* 24)

in green sand with the pattern in the position shown at the left. A three part flask is employed, the drag being split vertically through the center on two opposite sides, with a locking device to hold the two parts together. The cope is removed first in the ordinary manner. Then the two halves of the drag, with a half pattern in each, are unlocked and turned temporarily on edge for the removal of the patterns. After the patterns are drawn, the two halves of the drag are replaced on the bottom board and locked together. The cope is then replaced on the dag mold.

The method is typical of the ingenuity displayed in the solving and simplifying of many apparently difficult molding problems. The pattern at the right in the same illustration is for a bookkeeping machine base. Method of gating and density to which the sand is rammed over the surface are important factors in the production of a perfectly flat casting and one in which the contraction is uniform.

A three-part pattern and one of the resulting castings made entirely in green sand are shown in Fig. 3. In addition to a nice, accurate and easily workable pattern it is apparent that the composition and condition of the sand plus a considerable degree of molding skill are required.

Jack plane bodies shown in Fig. 11, although apparently simple, present a peculiar problem in that warpage of the castings depends almost entirely on the manner in which the cope is rammed. The castings must be clean and smooth and what is still more important they must be perfectly straight. Where the cope is rammed to a uniform density, the longitudinal ribs in cooling will pull the casting slightly from a straight line. Singular as it may seem, in some instances the face of the plane may be slightly concave, while in other instances the face will be convex. After making one or two experimental castings and noting the particular tendency, the molder varies the density of the sand above either the ends or the center.

Castings are molded in pairs in plain wood flasks and gated at both ends as shown in the illustration. Drags are molded on a plain, flat plate, while the copes are molded on a simple stripping plate machine through which the patterns are dropped a slight distance by a hand operated lever, before the cope is lifted from the plate. The sand is rammed by hand and the relative degree of density is determined by the molder through a species of intuition or instinct to be acquired only through practical experience.

The casting shown at the lower left in Fig. 10 presents another interesting example of the manner in which dry sand cores have been utilized to simplify the making of a green sand mold. The casting is poured in the opposite position to that shown in the illustration and the two half cores shown in the center of the illustration are placed in the mold to form the upright projecting member including the long and short lateral branches. Another small core not shown, forms a small passage through the upright member and branches and connects with the small four-way core shown second from the right. This second core forms a continuous passage inside the perimeter of the casting with an opening at each of the four corners. The under side of the casting has a pocket with a definite angle of 17½ degrees on which machining has been eliminated by the small circular core at the right.

Upper cores left and right in the same illustration represent the copes for two types of oil burner castings. The drags are made in green sand presenting a perfectly flat surface on which the cope or covering core is placed. The center core in the same illustration, as referred to previously, is one of eight sections of a complete ring with a great number of small tapered teats to form openings through the automatic stoker casting shown upper left in Fig. 6.

Interesting testimonial to the reputation of the Sessions Co., is shown in the accompanying facsimile of a letter written from the laboratory of Thomas A. Edison, Orange, N. J., dated March 28, 1894 and signed by the eminent inventor himself. Characteristically brief

(*Concluded on page* 65)

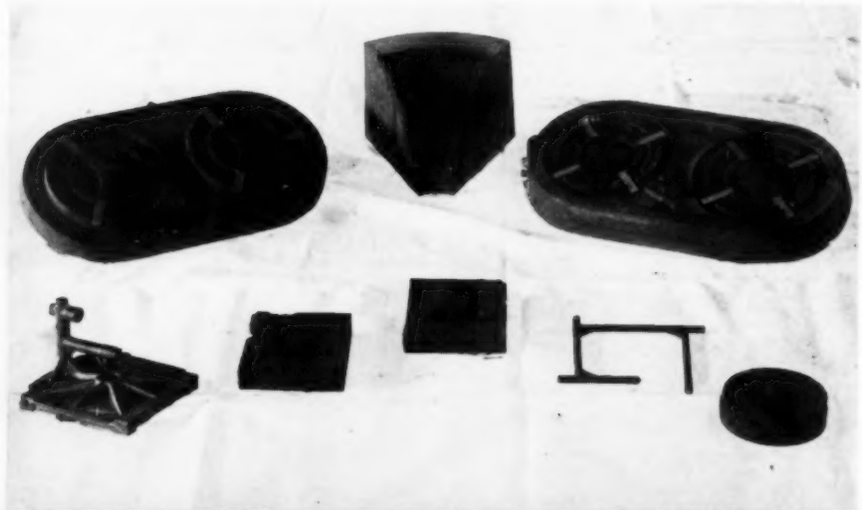


Fig. 10 (Above)—Front row shows casting and necessary set of cores. Top row left and right typical oil burner cores. Center core is section of a large ring core for the casting shown in Fig. 6, part of an automatic stoker. Fig. 11 (Below)—Density of ramming is important factor in producing straight castings

ADVERTISING PAGES REMOVED

(*Concluded from page* 62)

and without the elaborate salutation and complimentary ending common to the correspondence of the period, the letter reads:

Sessions Foundry Co.,
Bristol, Co.

The several hundred thousand pounds of castings ordered from you have all been delivered and we desire to say that they have been quite satisfactory both as to price, time and quality.

Yours
Thomas A. Edison

In keeping with the practical application of many ingenious devices and shop kinks on the molding floors it is only natural to find that the hand ladles employed in pouring the iron have been streamlined and otherwise improved over the conventional design. The bowl is cast iron 3/16-inch thick, rounded on the bottom and provided with a spout at the top. Instead of the usual type of shank in which the ladle rests in a ring, the shank for this ladle terminates in a tapered offset which fits into a corresponding dovetail socket near the top outside edge of the ladle as shown in Fig. 5. As may be noted in the illustration one ladle is adapted for right hand and the other for left hand pouring.

Miscellaneous character of the castings produced in the section of the foundry devoted to heavy work is indicated in several of the accompanying illustrations. The two castings shown in Fig. 10, later were machined to form a single unit, a rubber machinery drum 8 feet in diameter, 10 feet in length. Metal thickness in each casting is $1\frac{1}{4}$-inches and weight of each section slightly over 4000 pounds. Inside and outside of the mold were formed in dry sand cores, built up in sections, with another set of cores to form the double hub. Steel tube spokes connect the hub with the rim.

Boat keels are cast in various shapes and lengths. The keel shown in Fig. 13 was cast in two sections with a total overall length of 38 feet and total weight of 16,380 pounds. Each of the anvil blocks shown in Fig. 9 weighed 19,000 pounds, while a larger casting of the same general type shown in Fig. 2 weighed 60,000 pounds.

These castings are made in dry sand molds either in pits in the floor, or in large flasks dried in ovens provided for the purpose. Lighter castings molded in green sand in this section of the foundry embrace nearly everything capable of being produced in gray iron and among other things include municipal castings, columns, billet molds, press parts, pots of all sizes and shapes and molds for casting copper.

Study Dust Control Standardization

The Dust Control Equipment association at its meeting in Cleveland early in June gave careful attention to reports from the engineering committee of the association dealing with work in establishing standards of dust control practice, the need for which has existed for quite some time. The association endorsed the recommendations of the engineering committee with regard to the adoption of a friction chart and the development of a formula for use in connection with that chart.

During the meeting the association was addressed by Theo. Hatch, associate dust control engineer, division of industrial hygiene, department of labor, State of New York, on the subject "Importance of Modern Standards and Methods of Dust Analysis upon Design and Efficiency of Dust Control Equipment." Mr. Hatch, who spoke in the light of his personal knowledge and opinions rather than as representing the rules and regulations of the division of industrial hygiene of his home state, discussed methods used in cleaning dust from air in South African gold mines. He went into considerable detail on the question of the size of dust particles and the relative importance of the different kinds of dust.

He then discussed in some detail the various types of equipment available for determining dust count and showed why he considered it unsatisfactory to attempt to establish factors on the basis of a very close determination. His talk contained a great deal of information of practical use to dust control equipment manufacturers and those with whom they have contact.

If two men can barely handle a load, three should be used. This is not waste of labor—just good planning. The waste comes from having a man on the disabled list, nonproductive, but an overhead expense, and this may be the deciding factor between profit and loss on a given job.

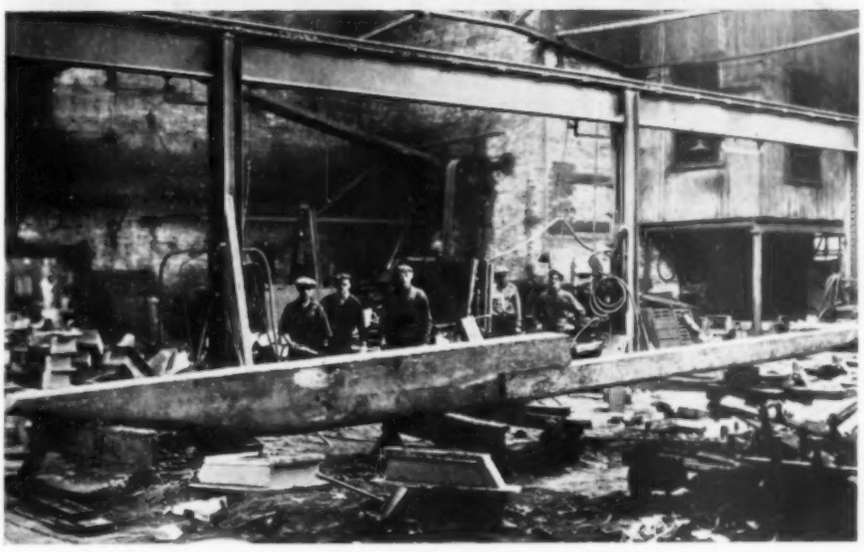


Fig. 12 (Above)—Miscellaneous castings involving green sand and dry sand cores. Fig. 13 (Below)—38-foot boat keel in two sections, total weight 16,380 pounds

Nonferrous Melting Operations

(*Concluded from page* 26)

some instances become entangled in the metal and small globules thereof even may be carried by the pouring streams into the mold and produce slag spots in the castings themselves. Therefore, it will be seen that choice of the material for lining this type of furnace is one which deserves to be studied carefully and the proper material universally used. No exception should be allowed.

There are two general ways of lining these furnaces. One is to ram a monolithic lining around a form in the shell. The other is to line with bricks formed to fit the shell and cemented together with the proper fire clay. Either method is satisfactory, provided the right kind of materials is used. Obviously, since there are metallic oxides present, an acid lining would tend to slag off. Therefore, a basic or neutral type of fire brick or fire clay promises more life and less slag.

Care Is Important

There are a number of such linings available and it is not our province to recommend any particular one. We do, however, want to urge the most careful attention in the installation of these linings, since care repays itself many fold in the life of the lining and the satisfactory operation of the furnace itself. Where a monolithic lining is rammed into the shell, it will be found that drying out the moisture should be done very slowly as otherwise the steam developed from the moisture in the monolithic lining will leave passages into which the metal will creep when the lining is subjected to a melting period.

When this monolithic lining is well dried it then should be subjected to a gradual increase in temperature from the burners in the furnace up to as high a temperature as the burners will deliver, so as to slightly glaze the surface before charging takes place. After the furnace lining has once had a good glazing of this type, it may be charged and the regular process of melting may ensue.

In charging it is most desirable not to destroy the glaze by charging heavy pieces of metal, ingots and the like with force enough to harm the glazed surface. Many furnace users have found it desirable to lay a small amount of borings or fine scrap in such a position as to absorb or cushion the effect of the heavier pieces as they enter the furnace. Others lay the heavy pieces in very carefully with tongs. Certainly, any method that will result in a minimum amount of abrasion is most desirable and will insure increased life of the furnace lining.

In lining with formed or shaped brick, these should be placed carefully so that they are supported well by the shell and the edges between the brick wall cemented but with an absolute minimum of cement. Then the furnace should be dried slowly and carefully so that the moisture from the cement may be evaporated slowly, thus avoiding the development of pores through which the steam passes. These pores would otherwise be crevices through which the molten metal could pass and make trouble. After this the furnace should be glazed as in the case of the monolithic lining, and the glaze should be preserved as carefully as possible.

Combustion Must Be Complete

In the operation of this type of furnace, there are a number of factors that must be considered. Since the metal necessarily is played upon by the flames, combustion must be complete. In fact it is desirable to have an excess of oxygen present even after the combustion has been completed, though such an excess does tend to form oxides of the metal.

It is preferable to have oxides of the metals than to have underburnt or underoxidized gases absorbed by the metal and later ejected as the metal solidifies, thus forming gas holes and imperfections in the castings themselves. In view of these facts, the proper supply of air should be maintained at all times. If the air could be preheated, it would increase the efficiency of combustion materially. Preheated oil which is found in some plants, aids in the vaporization of the oil materially and, therefore, helps in the more complete combustion of fuel oil.

Where gas is used instead of oil, of course, the problem of vaporization does not exist; but the problem of controlling the mixture of air with gas does exist and should be arranged so that the combustion takes place at the earliest possible moment after the gases leave the burner. Thus, the gases that do strike the metal are more likely to be burned completely before contact with the metal.

A furnace operator should be trained carefully in the operation of these furnaces. He should be instructed in all the necessary steps to insure uniform conditions in the furnace. The burner orifice should be kept clean and smooth so that the burning gases may flow freely. Some of the barrel type furnaces are supplied with a rocking mechanism which permits washing the molten metal over the superheated refractory lining. That transfers the heat from the lining to the melting bath and helps in the melting process. It also tends to reduce the overheating of the refractory lining.

All these linings, in spite of care on the part of operators and users, do absorb some of the metals which are melted on the hearth. Consequently, where careful control of the analysis of the different melts is imperative, it will be found important to have different hearths for the different types of metals so that contamination of one alloy with that of other metals previously melted on that same hearth may not affect the analysis of the product adversely.

Furnace operators should keep furnaces clean. Use of crowbars and sledges for the removal of chunks and slag will be disastrous to the maintenance of a good lining. The furnace should be slagged out each day after the melting is completed. To do this the empty furnace should be well heated and rolled about until the slag is washed over the inner surface. The furnace then is turned upside down to allow the balance of the slag to run out and is left in that position to cool slowly through the night preparatory to operation the next day.

Heat Up Slowly

If, upon examination, after this slagging out has taken place, some spots in the lining should show excessive erosion, patching should be done carefully. The patching should be laid on in relatively thin layers and allowed to cool slowly. When the furnace is to be used, the heating up also should be slow so that the patches will not spall or break off. We would again emphasize the danger to the linings in throwing heavy chunks of metal on them and urge the avoidance of this practice in this type of furnace.

The rocking furnace is the most common type of electric-arc furnace found in the nonferrous foundry. This furnace has a barrel resting on trunions with the electrodes entering the barrel through holes in both ends at the axis of the barrel. These electrodes are fed in and out by mechanical means so as to maintain the proper length of arc and the heat developed by the arc is transferred to the lining or the metal which rests on the lining.

The furnace is provided with a means of rolling the barrel so that the metal may be washed over the lining and thus cool the lining down and transfer some of the heat from the superheated lining to the metal. It will be seen from this that the heat transference is by direct radiation from the arc to the metal coupled with the indirect tranference of the heat from the arc to the lining to the metal.

Since the metal rests on the lin-

(*Concluded on page* 68)

Put JOBBING on a PRODUCTION Basis!

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DAVENPORT Jolt Rollover Draw—a fast, accurate, universal machine completely air-operated. Adjustments easily and quickly made. All working parts protected from sand. Sizes from 26" x 50" to 50" x 96" flasks.

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(*Concluded from page* 66)

ing, conditions relative to reactions between metal and lining are the same as in the case of the barrel type refractory furnace previously described. Therefore, the proper type of refractory must be used so that the chemical action of the metallic oxides will not form slags that are so fluid as to flow and thus erode or wash out the lining.

These linings are preformed in sections, especially made to fit the different size furnaces on the market and should be installed so as to insure a minimum amount of cement or bonding material between the sections of the lining. Brick to brick contact with a sufficient amount of cement to bond the bricks together and thoroughly fill up the pores between is the ideal situation.

After lining a new furnace it should be brought up to temperature very slowly so any moisture may be liberated with as little force as possible and the lining may be dried out thoroughly before the temperature rises much. The temperature control of this furnace depends upon the period during which the arc is allowed to play. Therefore, the furnace operator can only change the temperature of the furnace by turning on or shutting off the arc. In other words, there is no half arc or fractional arc available for low temperature operation or maintenance period.

Since the temperature is standard for a given current input, once the furnace has reached the temperature, and it has been determined how much current it takes to melt a given quantity of metal to a given temperature in a fully heated furnace for the same amount of metal of the same analysis, that same amount of current input will indicate that the metal has reached the same degree of temperature.

Since the metal necessarily is in contact with the lining or hearth of the furnace, the same problem arises in this type of furnace as in the reverberatory type. Namely, the lining does absorb some of the metals from one charge and may give them off to a subsequent charge. Therefore, if precise control of the analysis is imperative, different hearths for different types of melts will be found desirable. On this account some foundries operate a number of small electric furnaces rather than one larger size one.

In the maintenance of this type of furnace, it is desirable to slag it out after each day's operation as in the previous description of oil-fired reverberatories and to allow it to cool off slowly at the end of the melting period so as not to chill the refractories and cause the surface to spall. In general, this type of furnace will be found very economical where current cost is low, and it will deliver a high quality of product if it is intelligently operated, just as in the case of other types of furnaces.

The choice of these different types is materially influenced by the cost of current or the cost of other types of fuel as the case may be. However, the economical operation of any of these types of furnaces requires careful study of their operation and experience that will insure the proper intelligence applied to each of the many details. Such knowledge should avoid gassing of the metals and insure the production of highest quality melted metal available for pouring into the molds.

Adventures of Bill

(*Concluded from page* 53)

" 'Go easy, Boss,' he says. 'Rememba whut de boad of directahs said about ovah exe'tin' yuseff. Let Gawge do it. Deys a fella up in Clevelan' probably sittin' on his fat li'l fanny, jes' killin' time. Call in li'l Dolly Va'den and have her drop him a line an' let him gnaw his nails ovah it.'

"Well Cuhnel, Suh, as of course you are aware, the subject is rather involved and presents almost endless ramifications. In *Principles of Iron Founding*, the late Dr. Moldenke devotes 16 pages to this phenomenon. J. E. Hurst in *Metallurgy of Cast Iron* refers to it rather extensively. John Bolton touches on the subject in his recently published *Gray Cast Iron*. In a bibliography published by the American Foundrymen's association, no less than 58 references are given to articles on the subject in American and foreign publications.

"However, now that I have thrown a good stiff scare into you, I am happy to say that I think you can get all you want in a paper *Volume Changes of Cast Iron*, by C. M. Saeger and E. J. Ash, bureau of standards, Washington, presented at the Detroit, 1932 convention of the American Foundrymen's association."

Foundry Establishes Fellowship

The Robert Tillman memorial graduate fellowship in metallurgy recently was conferred on Peter A. Vukmanic, graduate student at Carnegie Institute of Technology, Pittsburgh. The fellowship, carrying a grant of $1200 a year, was established several months ago by Ralph F., Lambert J., Joseph L. and Raymond L. Tillman, in behalf of the Industrial Steel Casting Co., Toledo, O., now the Unitcast Corp., as a memorial to their brother, Robert B. Tillman, who died Jan. 24, 1934.

Officers Elected by Detroit Chapter

The annual meeting of the Detroit chapter of the American Foundrymen's association was held at the Glen Oaks Golf club on Thursday, June 17. L. C. Hill, factory manager, Murray Corp., discussed the method of selecting and training apprentices used by that organization. He also stressed the value and importance to all industry of training boys as apprentices in the various mechanical trades.

A resolution expressing deep regret at the passing of Fred Erb was presented by a committee composed of J. D. Stoddard, William B. Crawford and Vaughan Reid, and was adopted unanimously.

The following officers were elected for 1937-38: Chairman, R. B. Crawford, Atlas Foundry Co., vice chairman, Ira F. Cheney, Griffin Wheel Co.; secretary, Harry J. Deutsch, Aluminum Co. of America, treasurer, William W. Bowring, F. B. Stevens Inc.; directors for one year, Harry W. Dietert, H. W. Dietert Co.; Joseph F. Dostal, Eaton-Erb Foundry Co.; directors for two years, J. D. Stoddard, Detroit Testing Laboratory; D. J. Meloche, American Radiator Co.; and directors for three years, Glenn Coley, Detroit Edison Co.; Leslie G. Korte, Atlas Foundry Co

Trade Associations Are Studied

Trade association department, chamber of commerce of the United States, Washington, recently has prepared two publications. The first pamphlet, "Development of Trade Associations," traces the evolution of the trade association movement and analyzes the development and present activities of trade associations and their services to members as well as to the public and the government. The growth in extent and scope of various activities of trade associations such as trade promotion, statistical services, uniform cost accounting and commercial arbitration, is discussed.

The second publication, "Use of Trade Association Statistics in Manufacturing," describes in a nontechnical manner ways in which association data are applied by business men in solutions to internal problems of management.

Care must be taken to see that the laborer is fitted for his work. The short, thickset type of man must be given the heavy lifting and handling jobs, while the lighter work goes to the slightly built, tall men.

ADVERTISING PAGES REMOVED

Training Encourages Youth

(*Concluded from page* 27)

tunately most lives have more than one goal. We cannot fix too firmly the career of youth. The world of industry changes and we change with it. Such changes may transform the wisest decision into despair, and one of a host of circumstances may bar the road to progress. Often health conditions make changes imperative. New ambitions may demand new objectives. There is no final choice of work while life remains. Burdens and obligations which come with manhood are considerations that must not be neglected in choosing a vocation.

When the youth, who has been denied a higher education has chosen the trade or job he is to follow he must take an inventory of himself and see how much he cares to invest in this particular job. If he is willing to invest heavily, there is one avenue open for investment, vocational training. Every individual capable of engaging in productive work needs specific training for occupational life.

Vocational or trade training may be secured in various ways. Many industries have installed vocational schools. Others cooperate with local educational systems. Both methods have proved satisfactory and gainful to management and worker. Classes are held as many times each week as practical under supervisions of plant and local school authorities. Technical and general subjects are taught. This type of training is most effective because in the larger plants the best equipment, machinery and laboratories, may be utilized in teaching. Also, the everyday problems are fresh on the minds of the worker and can be thrashed out in an orderly manner.

The factory course proceeds along two lines. Not only the mechanical and theoretical sides are studied, but the human element is brought out in the study of foremanship training. The physical, mental, moral and social well being of the workman become a matter of prime interest and concern to the management.

Foremanship training now is recognized as a very important phase of any trade and industrial educational program for several reasons. 1. It provides a valuable contact between management and the vocational program. 2. It provides a service of great importance to industry. 3. It is one of the best agencies of promoting the establishment of cooperation between industry in general and the public vocational program.

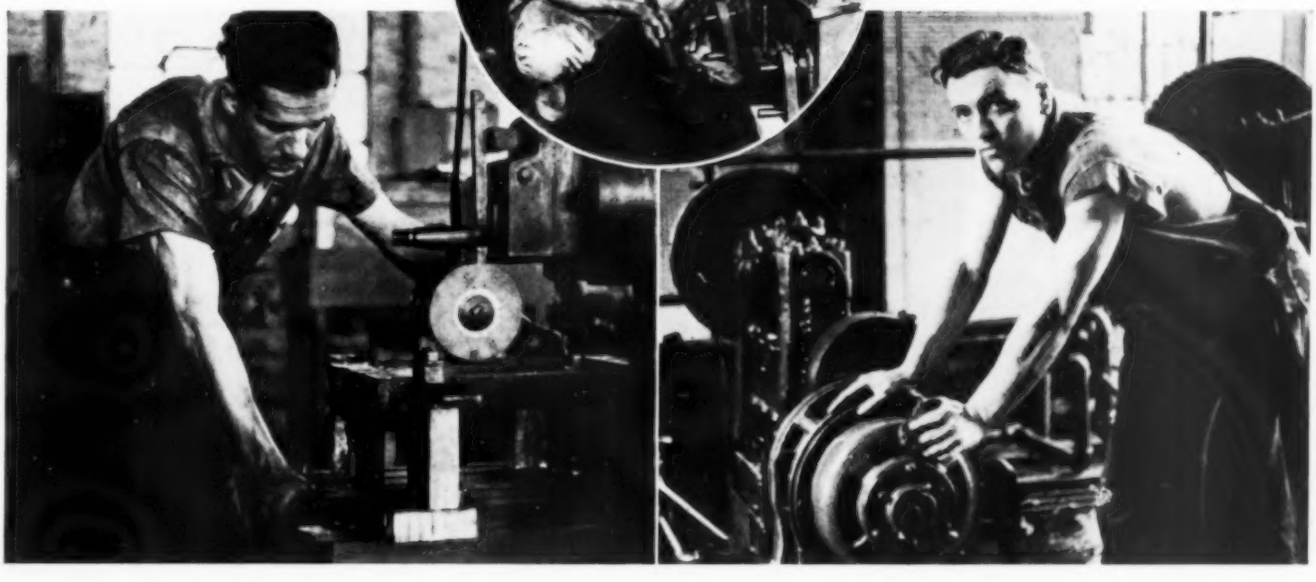
Industry must realize that despite mechanization, it remains a web of interwoven human beings. As these men grow, so grows industry. Employers must recognize that engaging a man's services carries the right to use them but not abuse them. Industry must realize that workmen cannot be denied the right to progress, the right to safe and steady employment and the right to live in a way that he and his family can maintain security, health and self-respect.

Fig. 6—Apprentice wood patternmaker operating lathe

Industry cannot pull itself up by its boot straps but must be jacked up from the bottom by building capable men and fitting them to their jobs. Workmen of this country have turned to industry and the great educational systems of the nation for counsel and training necessary for their progress and prosperity. Industry must bear its share of the burden.

Robeson Process Co. and the American Gum Products Co. have moved their general offices from 230 Park avenue to 500 Fifth avenue at Forty-second street, New York.

Fig. 3 (Circle)—Apprentice molder securing small box mold. Fig. 4 (Left)—Apprentice machinist using a grinding wheel on a shaper. Fig. 5 (Right)—Apprentice machinist cleaning a motor



Control Prevents Silicosis

(*Continued from page* 29)

of the centrifugal or rotary types) in which the air does not come in contact with any substance which may be harmful or objectionable have been applied to supply air for these respirators.

The report includes a complete discussion of the possible harmful contaminants of the air supply such as carbon monoxide, a number of sources of which are mentioned. A list of general remedial measures is included. Air-purifying units, which are rather widely used for removing objectionable oil and water mists, odors, dirt, scale and dust from the air supplied to respirators, also are discussed.

The minimum air supply for a respirator designed to use all the air for respiratory needs at a high degree of efficiency is at least four to six times the air breathed per minute. As a general class, respirators with loose-fitting facepieces, hoods, or helmets require more air than with tight-fitting pieces.

Adjustable Flow Desired

There is some difference of opinion among users of respirators as to whether or not adjustments should be provided whereby the wearer can vary the flow to meet variations in his requirements. Definite recommendations for all situations cannot be made, but for many situations, and particularly where tight-fitting facepieces are used, an adjustable flow is desirable and may even be necessary; also, most workmen can learn to adjust the air properly. On the other hand, fixed-flow procedures require a minimum amount of instruction and supervision and are the most conducive to safety under all conditions.

Abrasive blasting respirators are essentially any supplied-air device with its facepiece or headpiece designed to withstand and protect the wearer's head, neck and shoulders from abrasion by the rebounding of particles of sand or grit.

Since objection often is encountered in keeping the respirator on the man when he is being exposed to nonirritating but harmful dusts, the report includes practical suggestions for taking care of the personal factor. The responsibility both of employer and employe is outlined together with applicable ideas for getting workers to wear respiratory protection even when the supervisor's back is turned.

Personal respiratory protective devices must be maintained in a condition substantially the same as when received from the manufacturer. Where a considerable number of respirators are used, it is good practice to have a *respirator room* with an attendant who issues the respirators and cleans, sterilizes and otherwise keeps them in good condition.

A number of procedures for cleaning and sterlizing respirators are presented. It is suggested that recommendations for the proper procedure for a particular device should be obtained from the manufacturer.

The United States bureau of mines has set up an approval system for the purposes of aiding manufacturers in the developing and marketing of effective devices and to encourage the consumer to use such equipment. This approval system has been of great advantage in furthering the development of effective types of respiratory equipment and their adequate adaptation to protection from excessive exposures.

To meet the minimum requirements for approval under the bureau's schedule 19, mechanical filter dust respirators must meet rigorous tests for fit of the facepiece, efficiency and other characteristics of the filter and resistance to breathing. A current list of approved respiratory protective devices may be obtained from the bureau of mines.

Properties of dust which may determine its capacity to produce damage have been shown to be its composition, the quantity suspended in the industrial atmosphere, and its particle size. The determination of the concentration and character of industrial dusts permit evaluation of the extent of the dust hazard and also serve as a criterion of the efficiency of devices which have been developed for the control of the hazard. The methods used for the determination of the concentration and character of industrial dusts, together with a discussion of the practical application of such data to the engineering control of dust hazards, have been presented thoroughly by Bloomfield and DallaValle and by Drinker and Hatch.

The selection of the type of instrument to be employed for determination of dust concentrations is influenced by the desired objective. This may vary from a routine dust determination for the purpose of evaluating the efficiency of dust control methods to a detailed study of the concentration and character of dust in connection with medical and engineering surveys.

There is a definite need for dust determination apparatus which will allow the engineer at the plant to obtain an indication of the dust concentration in the air without the necessity of extensive training in the utilization of elaborate instruments or tedious laboratory procedures.

It is pointed out that where definite limits of dustiness are written into safe codes, a method of determination must be used which has a definite relation to the method employed in establishing code value.

Since particles of silica dust of a size greater than five microns in longest dimension seldom are found in the lungs, it is of value to know the particle size distribution of dust to which workers are exposed. Dust measurements have been made from samples collected by the Owens jet dust counter. Photographic methods have been used and also microprojection of the dust sample on a screen where the particle size can be measured by a ruler. Since the major portion of dust present in industrial atmospheres is small enough to gain entrance to the lungs, the plant engineer is not greatly concerned with particle size determinations.

Determination of Composition

The determination of the composition of mineral dusts found in industry often presents appreciable difficulties and requires a somewhat different technique than that which is customarily employed in chemical analyses. For certain dusts a combination of chemical and petrographic methods may be necessary and in other instances the ordinary chemical methods will suffice. This subject is discussed by Drinker and Hatch in *Industrial Dust.*

Determination of the composition of industrial dusts requires the development of some standardized procedure. Research should be directed to this entire matter, so that there may be developed a simple and easy technique.

Acceptance of responsibility for dust control by both management and employes is an important factor in a successful silicosis preventive program. This factor has long been effectively utilized in accident prevention and the greatest benefit from engineering dust control programs can be obtained by tying in the prevention of silicosis with the prevention of accidents, making them both integral parts of the safety program.

Management's responsibility may be grouped under five headings:

1. *Compliance with statutory provisions:* Management should at least meet local and state laws or codes, but it should be borne in mind that these usually stipulate minimum requirements.

2. *Determination of the severity of the dust exposure;* A survey of the entire plant for excessive dust exposures should include the making of dust counts. Assistance can be obtained from bureaus of indus-

(*Concluded on page* 74)

Type D Roto-Clone (Dry Dynamic Precipitator) collecting dust from grinding stands and vertical spindle disc grinder.

Type W Roto-Clone (Water Spray Dynamic Precipitator) exhausting and collecting dust from four tumbling mills.

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BECAUSE practically every foundry operation creates dust and presents an individual dust problem, the American Air Filter Co. has developed special foundry dust control equipment for this service, involving a minimum of installation expense.

Such operations as shake-out, sand-blast, sand handling or conditioning, core busting, core grinding, snag grinding, tumbling and cleaning no longer involve troublesome dust problems because of the ease with which Roto-Clone's principle of dynamic precipitation can be applied to them.

Roto-Clone is now furnished in three types in a wide range of sizes. Their compact design and desirable performance characteristics offer the following exclusive Roto-Clone advantages: (1) High Efficiency in dust separation. (2) Constant Performance under all operating conditions. (3) Uniform Air Delivery. (4) Low Power Consumption. (5) Small Space Requirement. (6) Low Cost. (7) Ease of Installation. (8) Unaffected by Temperature.

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(*Concluded from page* 72)

trial hygiene now established in most industrial states.

3. *Acquisition of information on best engineering practice, and adoption of the necessary devices and procedures:* "Best engineering practice" can be obtained from such sources as the leaders in a given industry, competent engineers, and codes prepared by certain industries. In adoption of dust control measures, good operating procedures are often more effective and economical than mechanical equipment. The development of such procedures comes only through constant education from the top down.

4. *Instruction of employes:* As in accident prevention, the foreman is the key man. He should be instructed thoroughly by the management and give the workman a correct picture of the need of keeping his dust exposure as low as possible. The program of the American Foundrymen's association through its committees on health and safety could be followed by other industries to advantage. In individual plants, safety committees can further education in dust control. Where a booklet of *Safe Practices* is given the new employe, suggestions for reduction of dust should be included.

5. *Regular use and maintenance of dust-control machinery and protective equipment.* The employer has both the right and the obligation to compel the use of equipment for prevention of silicosis. The campaign of education should be backed by discipline.

Employes' responsibility includes both the use of dust control and protective equipment provided by the management and also compliance with all safe practices suggested by the management for the prevention of silicosis. The worker should understand that breathing of silica dust in amounts sufficient to produce silicosis produces no immediate effects—there is no irritation of nose or throat. When noticeable symptoms or disability results, it may be too late for remedy.

The employe should realize that the safe practices recommended by the management are designed to prevent injury to his fellow workers as well as to himself. He is frequently in position to notice faulty practices even better than the management, and he should make it a point to report all such to his foreman.

The committee recognizes the fact that uniform standards of dustiness for all processes and materials are impracticable. However, dust concentrations found at various operations presenting dust exposures as shown in the literature are included in this report.

Gray Iron Founders Hold Meeting

(*Concluded from page* 28)

cence." The first is recent legislation, particularly the corporation surplus tax which makes it necessary to calculate depreciation and obsolescence more carefully than ever before if corporations are to be maintained economically sound. The second, is the constant rise in standards of perfection of products and service which in turn places greater demands on plant and equipment. Prof. Norton stated that it is not possible to set standard depreciation rates or to prescribe in detail a standard system for calculating depreciation charges for a group of manufacturers whose plants are operating under different conditions.

Prof. Norton stressed the fact that depreciation is a production cost paid in advance. It is as real a cost as such current cash items as labor, material, rent and power. It differs from these items only in that it is full, prepaid operating expense, the entire payment being made at the time the asset is purchased.

W. J. Donald, managing director, National Electrical Manufacturers' association, spoke at the afternoon meeting on "The Use of the National Trade Association in the Light of Pending Federal Legislation."

Directors Are Elected

The following directors were elected at the business meeting Friday afternoon: A. A. Campbell, secretary, Dake Engine Co., Grand Haven, Mich.; C. R. Culling, vice president, Carondelet Foundry Co., St. Louis; George J. Golden, superintendent, Golden's Foundry & Machine Co., Columbus, Ga.; E. C. Graham, manager, Acme Foundry & Machine Co., Blackwell, Okla.; William J. Grede, president, Liberty Foundry Co., Wauwatosa, Wis.; F. R. Hoadley, president, Atwood Machine Co., Stonington, Conn.; R. E. Kucher, vice president, Olympic Foundry Co., Seattle; H. R. Lafferty, vice president, Red Jacket Mfg. Co., Davenport, Iowa; W. P. Laytham, president, William P. Laytham & Sons Co., Paterson, N. J.; C. B. Magrath, president, North Western Foundry Co., Chicago; S. C. Mefford, secetary-treasurer, Auburn Foundry Inc., Auburn, Ind.; R. D. Phelps, president, Francis & Nygren Foundry Co., Chicago; J. H. Pohlman, vice president, Pohlman Foundry Co. Inc., Buffalo; Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O.; W. L. Seelbach, secretary-treasurer, Forest City Foundries Co., Cleveland; George W. Shomo, treasurer, Confer, Smith & Co., Hamburg, Pa.; and R. S. Wheeler, manager, Framingham Foundries Inc., Framingham, Mass.

The new board of directors then elected the following officers for 1937-38. President Peter E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, O.; vice president, R. E. Kucher, Olympic Foundry Co., Seattle; secretary, J. H. Pohlman, Pohlman Foundry Co. Inc., Buffalo; and treasurer, W. L. Seelbach, Forest City Foundries Co., Cleveland.

Rain Hampers Outing At Pittsburgh

Rain hampered some of the outdoor sporting events at the annual picnic June 21 of the Pittsburgh Foundrymen's association, but it failed to dampen the spirits of the 300 persons attending the outing.

Wildwood Country club, near Pittsburgh, was the scene of the event. The golf schedule was about the only one on the extensive outdoor program which was not washed out. At 6:30 p.m. the members and their friends sat down to a chicken dinner, which was followed by a variety of indoor sports.

Picnic committeemen included: Dinner tickets—H. C. Paul, Mackintosh-Hemphill Co.; golf—J. K. Mitchell, Harbison-Walker Refractories Co.; baseball—J. A. Graham, Duquesne Steel Foundry; tennis—J. M. Stewart, Hickman, Williams & Co.; horseshoes—H. D. Fowler, J. S. McCormick Co.; swimming—D. E. MacLean, Lava Crucible Co.; dinner—A. C. Barbour, Roessing Bronze Co.; publicity— C. O. Fisher, Advance Pattern Co.; transportation—Peter Soffel, Pittsburgh Metals Purifying Co.; prizes—H. D. Fowler, J. S. McCormick Co.

The calling off of the baseball game between foundrymen and supply men, because of the rain, was a disappointment to supporters of both sides. J. A. Graham was in charge of the foundrymen's nine; P. M. Essig, Ingersoll-Rand Co., was in charge of the supply men's team.

Opens New Plant

Linde Air Products Co., a unit of the Union Carbide & Carbon Corp., New York, has opened a new acetylene plant at 2330 Armistead Bridge road, Norfolk, Va. The company has opened a new oxygen plant also at Powhattan avenue, Essington, Pa., near Philadelphia.

New Warehouse

Federal Foundry Supply Co., Cleveland, has opened a new warehouse at 1717 Summit avenue, Richmond, Va. A complete stock of facings and supplies will be carried. Norman L. Cavedo is district representative.

ADVERTISING PAGES REMOVED

Progress Made in Cast Irons

(*Continued from page* 32)

same base iron usually obtained from a single cupola, the first method, that of ladle additions, is the only choice. This method frequently has been criticized, and often with just cause. Alloying in ladles cannot be done in a satisfactory manner with dull iron or when sprinkled on top of a full ladle. The best method is to trickle the alloy into the stream of hot metal as it is tapped from the cupola, conveniently accomplished through funnels located over the spout. Alloys are sometimes heated to a red heat before adding to the ladle, and less frequently, are melted and added in the molten state.

Use Briquetted Alloys

Introduction of alloys incorporated in pig iron or briquetted alloys added to the furnace charge is a good method for cupola practice. The briquetted alloys consist of a mixture of ground ferroalloy and a refractory cement. The briquets are of uniform weight and may be added to the charge by count, thus eliminating a weighing in the charging operation. Claims made for the briquetted alloy are a decrease in loss of alloy due to oxidation, and the briquets do not melt until well down in the melting zones; the advantage is the alloy is confined to the charge and insures uniform percentages of alloy in the iron after it has passed the melting zone.

Addition of alloys to cast iron may greatly alter the physical properties of the iron, and each alloying element imparts characteristics which are more or less different from those of another. To obtain the greatest benefit from alloys, it is essential that a clear knowledge of their influence be known. Foundrymen often have been advised, and truly so, that the base iron must be of good quality, for alloys are not a cure-all, and when added to inferior metal, the results are disappointing.

Physical properties and characteristics which usually are affected by the addition of alloys are eutectic composition and temperature of solidification, eutectoid composition and point of formation, hardness, fluidity, shrinkage, strength, impact resistance, chilling characteristics, structural components, graphitizing reactions, size of graphitic flakes, and fracture.

Chromium hardens the iron. It stabilizes the carbides, and thus prevents or retards the formation of free ferrite and undue softening in sections subject to slow cooling, such as in the cylinder bore. As a result a more uniform hardness is obtained in all sections of the casting. Chromium retards growth and corrosion. It restricts the formation of large flake graphite and produces a finer fracture.

It reduces the amount of carbon required in the eutectic composition and raises the freezing point of the eutectic. It reduces the amount of combined carbon required in the eutectoid composition and increases the temperature of formation of the eutectoid or pearlite, which is a significient attribute in cylinder iron. Chromium is usually added in amounts ranging from 0.10 to 1.00

Fig. 8—Charging iron into the cupola

per cent in automotive cast iron.

Effect of nickel on cast iron is in many ways quite the reverse of that of chromium as nickel is a graphitizer. It increases the fluidity slightly, and reduces the chilling tendencies in thin sections which is quite an advantage in complicated designs of castings. It facilitates machining. It decreases the amount of combined carbon required in the eutectoid composition and also lowers the temperature of formation. It lowers the stability of the carbides when used in amounts below 2 per cent. When alloying with nickel it is advisable to carry a lower silicon content in the iron in order to obtain the greatest benefit. It would appear that the combined use of nickel and chromium would be illogical from what has just been said as to the effects of these two metals on cast iron; yet the simultaneous use of these metals is general practice. The beneficial action of both are retained for the most part, and in the presence of nickel, a higher chromium content may be carried. Such a combination increases the hardness, the strength and the wear resistance of the iron with satisfactory machinability.

Molybdenum is most effective in its action on the physical properties of cast iron. It has little influence on the eutectic composition, the freezing temperature or fluidity, but reduces the amount of carbon required in the eutectoid composition. The addition of molybdenum greatly increases the tensile, transverse, impact fatigue, torsional and fatigue strength of cast iron. It promotes a fine fracture and uniform hardness throughout large cross sections. It increases the hardness with a minimum of machining difficulty, and improves the wearing quality of cast iron. It increases the strength at high temperatures and thus is effective in the elimination of cracks.

Reduces Chill Depth

Copper was seldom used in cast iron until within the past few years. It is now being used quite extentively. One of the principal effects of copper is to reduce the chill depth and at the same time increase the hardness with no added difficulty in machinability. It has been found effective in combination with chromium and nickel in eliminating beating down of valve seats and warpage in cylinder bores. It is usually used in amounts up to 1 per cent; in special instances larger amounts are used.

Vanadium is effective in stabilizing the carbides and retarding graphitization, as well as being a powerful deoxidizer. It has a tendency to cause the formation of sorbite, decrease the grain size of the matrix, and reduce or eliminate dendritic formation. In combination with titanium or zirconium, it promotes uniform hardness in light and heavy sections. Vanadium also increases the hardness and strength of the iron.

Small additions of from 0.10 to 0.20 per cent increase the depth of the chill slightly, toughen the chill and promote a more uniform hardness at different depths in the chill. Vanadium reduces the formation of free ferrite and improves the wearing qualities of gray iron. Use of vanadium at present is restricted to special applications. No doubt we are going to see it more extensively used and especially in combination with other alloys.

Lead, as far as the writer is aware, is never used in cast iron. Iron and lead do not alloy and when lead is added to the molten iron, it rapidly sinks to the bottom of the ladle with a profuse evolution of vapors and violent agitation. Experiments in the addition of lead, however, show that it has an appreciable hardening effect on cylinder iron with an increase in chilling

tendencies in castings, causing chilled edges and corners. It is interesting to note that this chilling characteristic and increased hardness was not observed to take place in low-carbon, high-test iron.

There are other metals such as titanium, zirconium, cobalt, boron, etc., and also nonmetals being used in a number of applications with beneficial effects. Further development and research will prove that many of these elements will provide a means of extending the improvement in specific qualities of gray iron and widen its field of usefulness.

Increases Fluidity

Aluminum is a deoxidizer and graphitizer and is effective in reducing chill and increasing fluidity. It has a tendency to coarsen the fracture of gray iron. Carbon in the form of graphite and also ferrosilicon are excellent deoxidizers and chill reducers. For chill depth control, amounts of from ⅛ to 1 pound per ton are usually sufficient in automotive work. Calcium silicon is a powerful deoxidizer and at the same time has a beneficial action on the strength of the iron. It promotes machinability and reduces the chill depth. The use of this alloy in cast iron is patented and is a constituent in the Meehanite process for the production of high test gray iron.

Good metal control has had much to do with the progress of automotive cast iron. No doubt extra effort has been extended along this line on account of the stringent specifications which have been promulgated by the automotive engineer and enforced by rigid and thorough inspection. By metal control, I refer to the system and methods employed for the purpose of checking and controlling the selection of raw materials, the melting practice, and the composition and physical properties of metal and castings.

We all recognize the importance and responsibility involved in the selection of raw materials; it extends back to the quality of the iron ore, blast furnace practice, coke, and a multitude of other details. It is absolutely necessary in the production of uniform, high quality iron, conforming to strict specifications, that rapid and reliable check methods be available for the control of the metal at all times. Fortunately, suitable methods have been developed and are being used in modern foundry practice.

The chill test is applicable with slight modifications to almost any foundry environment and melting equipment. For gray iron, the chill test has been found to be an exceptionally quick and reliable control test. Many different forms of chill test pieces have been designed. Usually two or more designs should be employed as it is almost impossible to obtain all of the information desired from one only. The chill tests are also supplemented by frequent chemical tests.

For efficient control, a chill test should be of such design that information as to the chill depth and fracture of the iron can be obtained within a fraction of a minute. With tests of this character available, the trend of the metal can be determined and controlled. The hardness of the chill test is comparative to that of the casting and is valuable for the purpose of anticipating and controlling the hardness of the casting.

The practice of stamping identifying numbers on the mold when made and assembled with the time of the hour when the mold is poured, and a chill rack with partitions for the collection of chill tests showing at what time the tests were taken, provides a system of checking the chill tests with the casting. The value of this method of checking cannot be overestimated. A complete history is obtained from the time the metal is tapped until the casting has passed through the machine shop. Other check tests include fluidity, contraction, transverse, impact, etc.

Considerable research is being done with spectrographic analysis of gray iron for control purposes to supplement or replace the much slower chemical tests in which so much valuable time is consumed in sampling. Spectrographic routine control tests are now being employed by one large gray iron foundry, and the future for this method looks very favorable.

Steel Directory Is Available

Steel Founders' Society of America, Cleveland, has published its 1937 directory of steel foundries in the United States and Canada. In addition to the names of the firms which are listed alphabetically, information is given on each firm's personnel, type of castings produced, size of castings produced, melting and annealing equipment, use of product, normal number of employes, monthly capacity in net tons, other products manufactured, trademark, etc. The directory is available for $10 through the society, located at 920 Midland building, Cleveland.

Visits Sand Plant In New Jersey

Metropolitan Philadelphia chapter of the American Foundrymen's association visited the plant of the New Jersey Silica Sand Co., Millville, N. J., on Friday, June 11. About 90 guests were present and inspected the modern plant and equipment of that company. The trip through the property included visits to the molding deposits; gravel deposits; the washing plant; plant for milling, preparing and loading molding sand and cupola and furnace sand; drying plant, and laboratory.

A buffet luncheon was served at noon at the plant and the visitors were taken to the Cumberland hotel, Bridgeton, N. J., for a dinner in the evening. Harry W. Dietert, Harry W. Dietert Co., Detroit, spoke following the dinner on "The Importance of Sand Testing and Control by the Shipper and the Foundry."

The illustration below shows the members and guests of the Chapter assembled at Millville.

Philadelphia Chapter members and guests at the New Jersey Silica Sand Co., Millville, N. J.

Why more and more foundries are adopting "Multi-Vane" Grinders

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A. S. T. M. Holds Meeting

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cent of the maximum deformation. In the bars broken, the fractures were not localized. The tests indicated that surface finish is not particularly important in tension. A written discussion of the paper, prepared by Prof. W. J. Schlick, Iowa State college, Ames, Iowa, was presented.

The second paper, "A Study of the Effect of Span on the Transverse Test Results for Cast Iron," by J. T. MacKenzie and C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala., was presented by Mr. Donoho. The series of tests performed indicate to the authors that the modulus of rupture increases with decreasing span. Also, deflection decreases with decreasing span but the decrease is much less than the conventional beam formula would indicate. The test also showed that the modulus of elasticity decreases with decreasing span. The amount of the effect of changing span depended largely upon the qualities of iron.

Participate in Discussion

Considerable discussion, both oral and written, followed the presentation of this paper. Those taking part included H. W. Stuart, U. S. Pipe & Foundry Co., Burlington, N. J.; Prof. J. B. Kommers, University of Wisconsin, Madison, Wis.; Prof. M. O. Withey, University of Wisconsin, Madison; Prof. W. J. Schlick, Iowa State college, Ames, Iowa; Prof. Herbert F. Moore, University of Illinois, Urbana, Ill.; W. L. Collins, University of Illinois, Urbana, Ill.; and James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

A paper "Relation of Properties of Cast Iron to Thickness of Castings," by H. L. Campbell, American Hoist & Derrick Co., St. Paul, Minn., was read in abstract by James T. MacKenzie. The author concluded that the tensile and compressive strengths of gray cast iron are dependent upon the size of the castings from which the test specimens are prepared. The metal in a light section has a higher strength than metal of the same composition in a heavy section. In giving the tensile strength of iron, it is necessary always to state the size of the casting from which the test specimen was obtained. Comments on the paper were offered by V. A. Crosby, Climax Molybdenum Co., Detroit, and Fred J. Walls, International Nickel Co., New York.

The final paper on the program was entitled "A Proposed Standard Classification of Graphite in Gray Cast Iron," by W. E. Mahin, Westinghouse Electric & Mfg. Co., formerly with the Vanadium Corp. of America, and J. W. Hamilton, Vanadium Corp. of America. The paper was presented by Mr. Mahin. The authors have set up a standard for classifying iron according to the length of the graphite flakes. Of these classifications, No. 1 is for flakes 4 inches in length or more; No. 2, flakes 2 to 4 inches in length, No. 3, flakes 1 to 2 inches in length; No. 4, flakes ½ to 1 inch in length; No. 5, flakes ¼ to ½-inch in length; No. 6, flakes ⅛ to ¼-inch in length; No. 7, flakes 1/16 to ⅛-inch in length; and No. 8, flakes 1/16-inch or less in length.

In the discussion which followed, C. K. Donoho called attention to the fact that some consideration should be given to the effect of polishing on the graphite flakes. That feature was discussed by Prof. Bradley Stoughton, Lehigh university, Bethlehem, Pa., and in a written discussion by George F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N. Y. A written discussion by J. F. Johnson, Florida East Coast railway, St. Augustine, Fla., suggested standardizing on 50 diameters for such tests. A. J. Herzig, Climax Molybdenum Co., New York, stated that probably more attention should be paid to the form of graphite in setting up such standards.

The nonferrous metals session was held Friday morning under the direction of W. R. Webster, Bridgeport Brass Co., Bridgeport, Conn. Report of committee B-4 on electrical heating, electrical resistance and electric furnace alloys presented by Dean Harvey, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., included mention of the activities of subcommittee V on wrought and cast alloys for high temperature use. That subcommittee has completed proposed appendices for short and long-time tension tests which include preparation of cast tension specimens of heat resistant metals (chromium-nickel, chromium-nickel-iron, and chromium-iron). These include specimens with shanks sufficiently long to remove threaded connections from the heated zone of the furnace, and describe a casting procedure which has been found satisfactory for producing sound castings. Equipment for the high temperature bend test has been completed and tests are being made. A warpage test specimen in the form of an eccentric tube is being studied to determine the relative tendency of alloys to warp at elevated temperatures.

Report of committee B-5 on copper and copper alloys, cast and wrought, presented by D. K. Crampton, Chase Brass & Copper Co., Waterbury Conn., stated: Subcommittee II on cast metals and alloys has not progressed far enough yet on considerations of adjustments in specifications covering various cast alloys to dispose of the tentative specifications for sand castings of the alloy: copper 80 per cent; tin 10 per cent; lead 10 per cent, which must be considered in relation to other alloys.

Report of committee B-6 on die cast metals and alloys, presented by J. R. Townsend, Bell Telephone Laboratories Inc., New York, included two papers by J. C. Fox, Doehler Die Casting Co., Toledo, O., on "Brass Die Castings," and by G. L. Werley, New Jersey Zinc Co., Palmerton, Pa., on "A Study of Die Design Changes for the Improvement of the Soundness and Uniformity of Test Bars."

Specification for Aluminum

Sam Tour, Lucius Pitkin Inc., New York, presented the report of committee B-7 on light metals and alloys, cast and wrought, which recommended that a proposed tentative specification for aluminum base alloys in ingot form for permanent mold castings be accepted for publication, and also recommended revision of the tentative specification for aluminum base sand casting alloys in ingot form. Both specifications contain, as proposed, a section relating to the precision requirements in chemical analysis, but the committee requested that those be withdrawn from publication. The session closed with reports from committees E-2 on spectrographic analysis, and committee E-3 on chemical analysis of metals.

Various phases of testing methods were discussed at a session held Thursday afternoon under the chairmanship of Prof. H. F. Moore, University of Illinois, Urbana, Ill. The first paper presented was a report of committee E-1 on methods of testing by W. H. Fulweiler, Wallingford, Pa., and summarized the activities of the various subcommittees. The second paper on "A Classification of Methods of Mechanical Analysis of Particulate Materials," by P. S. Roller, bureau of mines, New Brunswick, N. J., was reviewed by Dr. L. T. Work, Columbia university, New York. Discussion of the paper by Dr. Work, and J. R. Dwyer, National bureau of standards, indicated that method of determining particle diameter was an important factor.

R. H. Heyer, American Rolling Mill Co., Middletown, O., described an analysis of the brinell hardness test in which results indicated that sinking-in types of impressions are

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ADVERTISING PAGES REMOVED

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produced by relatively large surface compressions. Also in most cases sinking-in types of impressions were associated with relative weakness in shear as measured by ratio of shear to compressive yield strength, and ridging types were associated with a high ratio of shear to compressive yield strength.

Direct measurements of plastic deformation in thick specimens indicated that permanent distortion occurred at a depth greater than some of the minimum thicknesses recommended for tests, but it is possible that such effect is negligible on measurement. Other pertinent conclusions also were drawn. In discussing the paper R. L. Templin, Aluminum Co. of America, New Kensington, Pa., said that use of thin specimens for light alloys such as aluminum, gave good results due to various compensating effects including anvil effect of the testing machine. Dr. L. B. Tuckerman, National bureau of standards, Washington, stated that he preferred the term indentation tests rather than hardness tests, and that it would be well to investigate all variables associated with brinell testing to ascertain their effects. Others entering into the discussion included A. V. de Forest, Massachusetts Institute of Technology, Cambridge, Mass., V. E. Lysaght, Wilson Mechanical Instrument Co. Inc., New York, and Dr. Gensamer, Carnegie Institute of Technology, Pittsburgh.

Employs Strain Gage

L. A. Meisse, Ohio Brass Co., Mansfield, O., presented a paper in which he described a transfer mechanism for improving the adaptability of the Tuckerman optical strain gage so that it could be used in obtaining strain measurement in hitherto inaccessible locations. A paper entitled "Speed Control for Screw-power Testing Machines Driven by Direct-current Motors," by A. H. Stang and L. R. Sweetman, National bureau of standards, Washington, was presented by Mr. Stang. The final paper of the session was by R. K. Bernhard, Baldwin-Southwark Co., Philadelphia, on "Dynamic Tests by Means of Induced Vibrations". The author also showed some motion pictures to amplify the paper. The method employed in the tests involves the production of vibrations in the structure or specimen by centrifugal forces resulting from revolving eccentric disks.

Extensive discussions of creep tests featured the first section of the session on "Fatigue, Effect of Temperature" on Wednesday morning. A. E. White, president elect of the society presided. A progress report of the joint research committee on the effect of temperature on the properties of metals was presented by H. J. French, International Nickel Co., New York, and chairman of the committee. The report also presented a proposed revision of tentative method of test for short time, high temperature tension tests of metallic materials (E 21-34T) and a proposed revision of tentative method of test for short time, high temperature tension tests of metallic materials (E 21-34T), both of which were accepted.

A report on long time creep tests of 18 per cent chromium, 8 per cent nickel steel and 0.35 per cent carbon steel, prepared by Howard C. Cross and J. G. Lowther, Battelle Memorial institute, Columbus, O., where the tests were performed as a joint committee project, was presented by Mr. Lowther. The committee report also presented a paper "Discrepancies in the Load Carrying Abilities of Carbon Steels at 850 degrees Fahr.", by H. W. Gillett, Battelle Memorial institute, Columbus, O., which was presented by J. J. Kanter, Crane Co., Chicago.

An interesting comparison of working stress values was made in a paper "A Comparison of the Methods Used for Interpreting Creep Test Data" by Joseph Marin, Rutgers university, New Brunswick, N. J. A paper "New Equipment for Creep Tests at Elevated Temperatures" by P. G. McVetty, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., described a creep from 12 to 60 tests at different stresses in the same furnace.

In the final paper of the first portion of the program, John Boyd, Engineering Foundation, New York, discussed "The Relaxation of Copper at Normal and Elevated Temperatures".

H. H. Morgan, Robert W. Hunt Co., Chicago, and vice president elect of the society, presided at the second section of the session. Prof. H. F. Moore, University of Illinois, Urbana, Ill., presented the report of the research committee on fatigue of metals. An appendix discussed "Nomenclature for Various Ranges in Stress in Fatigue."

A paper "A Fatigue Machine for Testing Metals at Elevated Temperatures", by F. M. Howell and E. S. Howarth, Aluminum Co. of America, New Kensington, Pa., was presented by Mr. Howarth.

On several occasions during the sesssion, exceedingly interesting comments on British practice and work were made by Dr. John H. Gough, superintendent engineering department, National Physical Laboratories, Teddington, England.

Corrosion of both ferrous and nonferrous metals was discussed in considerable detail at a session under the joint chairmanship of F. N. Speller, National Tube Co., Pittsburgh, and R. J. McKay, International Nickel Co., New York.

The report of committee A-5 on corrosion of iron and steel was presented by its chairman, F. F. Farnsworth, Bell Telephone Laboratories, New York. As a part of this report, R. F. Passano, American Rolling Mill Co., Middletown, O., reported on the activities of subcommittee VIII on field testing of metallic coatings, and L. W. Hopkins, American Chain Co., Bridgeport, Conn. told of the activities of subcommittee VII on methods of testing. A brief report of the activities of committee B-3 on corrosion of nonferrous metals and alloys was presented by T. S. Fuller, General Electric Co., Schenectady, N. Y.

Classifies Corrosion

An interesting paper "Corrosion Testing Methods for Copper Alloys" by D. K. Crampton and N. W. Mitchell, Chase Brass & Copper Co., Waterbury, Conn., was presented by Mr. Mitchell. The authors classified corrosion phenomena according to cause and result. Considerable emphasis was placed on the alternate immersion and water line tests and the results obtained.

The remainder of the session was devoted to further discussion of the papers presented at the symposium on corrosion at the Chicago regional meeting of the society last spring. The papers and discussions first were reviewed by Mr. Hopkins, with considerable discussion from the floor following. Those taking part included R. L. Duff, Standard Oil Development Co., New York; F. L. LaQue and R. F. McKay, International Nickel Co., New York; J. R. Freeman, American Brass Co., Waterbury, Conn.; E. H. Dix Jr., Aluminum Co. of America, New Kensington, Pa., W. H. Finkelday, Singmaster & Breyer, New York; H. S. Rawdon, bureau of standards; and E. S. Taylerson, Carnegie-Illinois Steel Co., Pittsburgh.

Report of committee A-10 presented at a session on Wednesday under the chairmanship of N. L. Mochel, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., mentioned that the group of 9 specifications for alloy steel castings prepared by one of the subcommittees are being continued as tentative without revision, and that comments and experience in their use are being collected to form the basis for revision during the coming year. Much of the criticism received so far by the subcommittee has been directed to the tentative specifications for 20 per cent chromium, 9 per cent nickel alloy steel castings which were accepted by committee E-10 late in 1936.

The opening session included the report of committee E-9 on research, presented by P. H. Bates, Bureau of standards, and the report of committee E-10 on standards presented by Cloyd M. Chapman, consulting engineer, New York.

British Consider Problems

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of Birmingham. This medal was offered to the Institute in 1936 by E. J. Fox, managing director of the Stanton Ironworks Co., Ltd., who presented the sum of £500 for the purpose. The medal is to be presented to an individual who has contributed in some outstanding way to the progress of the foundry industry, with particular reference to foundry metallurgy. The choice of Professor Turner as first recipient was made on account of his work on the effects of silicon on cast iron, the original investigation having been made in 1885. The original paper was referred to in THE FOUNDRY of October, 1935, when Professor Turner's career was briefly described.

H. Winterton then passed the chain of office to C. W. Bigg, who took the chair. After his announcement relative to the gift of his firm, S. H. Russell proposed a vote of thanks and said that it was suggested that the capital endowed should form the nucleus of a special fund to be raised with a view to financing research work to be conducted by the institute. The proposal was seconded by J. W. Gardom, chairman of the Technical Committee, and supported by V. Jobson, chairman of Qualcast, Ltd.

Stress Need of Men

Mr. Bigg then delivered his presidential address, in which he reviewed one of the most urgent problems of the foundry industry—the recruitment of the right type of personnel, including recruits for the different sections of the whole industry, which must contain the material from which the heads of departments are made, not excluding directing executives. The industry's need is for men with practical experience, strengthened and enlarged by a sound practical training.

The presidential address was followed by the presentation of the third "Edward Williams" lecture: "Factors in the Casting of Metals," by Dr. C. H. Desch, superintendent of the metallurgical department of the National Physical Laboratory. The session ended with the presentation of the report of the costing sub-committee, which was introduced by the convener, V. Delport, European manager of THE FOUNDRY.

Two technical sessions took place on the morning of Thursday, June 10, one special session being devoted to papers on nonferrous subjects. The first paper was the French exchange paper: "The Problem of the Elimination of Gaseous Impurities from Aluminum," by George Chaudron, Institute of Applied Chemistry of Lille. In this paper the author describes a new method for the degasification of metals which has been perfected in his laboratory and by means of which it is possible, in particular, to effect the complete determination of the gases of aluminum. In this method the author employs the bombardment in a discharged tube where the projectiles are ions and electrons. The sample to be degassed is made the cathode in a discharge tube. The author also gives a comparison of the more simple methods of degasification which often have given practical results. None of these methods produces a metal freed from its gases, but practice has shown that metals thus treated have been satisfactory.

Aluminum Remelting

The German exchange paper, by H. Rohrig, chief engineer, Vereinigte Aluminum-Werke A.G., Lautawerk (Lausitz), was entitled: "Remelting Aluminum in the Foundry." The author points out that the principal objects to be achieved in remelting are: (1) preventing loss of substance; (2) preserving or restoring the quality. The paper discusses some of the features wherein aluminum and its alloys differ from the heavy metals with regard to remelting, and then discusses the factors which are materially responsible for attaining the objects aimed at in remelting.

The next paper was: "Notes on the Structure and Characteristics of Aluminum Alloys," by H. C. Hall, Rolls-Royce, Ltd., Derby, in which the author discusses some of the properties of aluminum alloys, making a survey of present knowledge, with particular reference to structure, life and physical strength. This was followed by a paper entitled: "Trends in the Non-Ferrous Foundry," by Dr. L. B. Hunt, editor of *The Metal Industry*, London.

In his conclusions, the author, dealing with the outlook for the future, states that to produce sounder and more uniform castings, foundrymen will require a considerable amount of new information on melting practice and on the properties of alloys prepared under ideal conditions—also a fresh outlook on such factors as pouring methods and the purification of melts by fluxes and other methods. Greater attention will need to be paid to casting under pressure, both for low- and high-melting point alloys.

J. O. Hitchcock, Mond Nickel Co., Ltd., contributed a paper on "The Use of Nickel in Non-Ferrous Alloy Castings," in which he reviews the scope of the application of nickel in relation to all the common nonferrous casting alloys. In the paper, attention is directed primarily to those alloys considered to be of special interest from the foundry point of view at the present time, *viz.*, bronzes and nickel and nickel-silver.

The first paper presented at the other session was the American exchange paper, by Owen W. Ellis, Ontario Research Foundation, Toronto, Canada, on "Wear Tests on Ferrous Alloys." Results obtained by the author have shown that many alloys of low brinell hardness number resisted abrasion as well as, and often better than, alloys of high brinell hardness number, and the present paper discusses more recent tests made on these lines. In his concluding remarks, the author states that numerous anomalies in these tests have yet to be explained, but that it is clear that mineralogical hardness *per se* is not the only property which affects the wear of alloys of different types.

Dr. A. B. Everest, Mond Nickel Co., Ltd., London, taking part in the discussion, pointed out that in many cases the life of an alloy in service is so short that one can easily simulate it in the laboratory. He said that it was brought out in the paper that wear is of many different types, and that hardness itself is not necessarily a measure of wear; in fact, hardness is not always desirable. He pointed out that good results have been obtained with an iron made of mixed austenite-martensite mixtures, which is rather a new departure, and he stated that an impeller made in this mixture lasted five weeks, against one week when made in ordinary iron. In reply to Dr. Everest, Mr. Ellis said that from his experience he believed that toughness is of the greatest importance in regard to the austenite-martensite mixture. It had been found that work hardness in those mixtures is very small indeed.

Use Alloy Steel

F. Hudson, Glenfield & Kennedy, Ltd., Kilmarnock, Scotland, said that he had just completed a research on the production of valves used in oil wells where very high pressure is used to circulate liquid mud, the pressures exceeding 1000 pounds per square inch. He stated that in the United States these valves are made in nickel-chromium steel. The speaker conducted tests on lines similar to those adopted by Mr. Ellis, but he mounted the test-piece on circular discs rotating very rapidly. Various alloys were thus tried, and the results obtained practically confirmed those arrived at by Mr. Ellis. It was found that pieces made of nitrogen-hardened

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steel wore out more rapidly than those made of austenite-martensite iron, or even those made of gunmetal. He confirmed the opinion that wear is not essentially relative to hardness, but largely to surface corrosion.

G. L. Harbach, Worthington-Simpson, Ltd., Newark, Nottinghamshire, referred to brinell hardness in relation to machining. He pointed out that cast iron is soft up to 150 brinell number, whereas nickel-chromium iron is still machinable at 250, but some bronzes come under the borderline much earlier—therefore, hardness is not really a measure of machinability.

Ingot Molds Discussed

The next paper was on "The Production of Ingot-Mold Castings," by R. Ballantine, Fulwood Foundry Co., Ltd., Mossend, near Glasgow, Scotland, in which the author describes the methods which he uses for the manufacture of molds. The discussion on this paper was opened by J. Roxburgh, of Sheffield, who said that the development of ramming the cores in ordinary sand, as described by the author of the paper, is an outstanding progress in this particular industry. Referring to the life of ingot molds, he expressed the opinion that in view of the present shortage of hematite, steelworks will use ingot molds longer, and that, in fact, specifications may become modified. He said that in Sheffield a head is provided in order to avoid defects at the top of the mold. With regard to the position of runners, he stated that in the large molds he had found that the centrifugal or tangential gate always gives good results, thanks to the spinning action exerted on the metal.

In replying, the author said that he did not think that a head was necessary, and he stated that in dodecagonal sections he was not in favor of centrifugal runners, because of a possible eddying effect, that might be detrimental. In reply to a question on analysis, the author said that a composition with from 1.7 to 1.9 per cent silicon and manganese not above 0.9 per cent suited him.

Prof. A. Campion, Glasgow, Scotland, said that the author had opened up a new aspect concerning the manufacture of ingot molds, and that his idea seemed to be to produce molds cheaper, and that, possibly, molds with a shorter life but cheaper to make might be more economical.

A speaker stated that he had found that with up to 1.2 per cent manganese the life of a mold was good; from 1.2 to 1.8 per cent, the life curve dropped, and from 1.8 to 2 per cent, there was again an improvement. He said that he knew of molds containing as much as 1 per cent phosphorus that had never caused any complaint. He also mentioned the question of blacking inside the mold. Mr. Ballantine answered that blacking is most important and should always be of the best quality. He uses a thickness of at least 1/16-inch and applies it with a brush.

Ben Hird, of Stamford, Lincolnshire, asked whether ingot molds give some of their carbon to the steel when it is poured in, and whether that was the cause of certain fine cracks that are occasionally observable. No definite answer could be given. Mr. Roxburgh, referring again to the contents of manganese and phosphorus, mentioned that in an American paper, by Regan, silicon was given as 1.6 per cent maximum and manganese 1.5 per cent, and that with those percentages the molds giving best service had been made. The speaker had himself proved good results with 1.75 per cent manganese some years ago. He also mentioned that a 3-ton mold containing 0.35 per cent phosphorus had had 340 lives.

A paper entitled: "Foundry and Laboratory Characteristics of Cupola Cokes" was contributed by Dr. Hugh O'Neill, London, Midland and Scottish Railway company, and J. G. Pearce, British Cast Iron Research Association.

In opening the discussion, Mr. Millington referred to several tests that had so far given negative results, and said that these tests should be further studied in the hope that more positive results would be obtained later. Mr. Pearce mentioned that coke is just as complicated a material as cast iron, and therefore, much work still has to be done before tests can be of a positive value. Tests can be used to sort out the various cokes.

Commenting upon the paper, Ben Hird stated that bad coke will spoil the best of irons. J. Roxburgh mentioned that to have high-quality castings one must obtain very hot metal at the spout, and he had himself proved that it pays to have high-quality coke. He queried whether size had any strong influence on results, and Mr. Pearce said that it had been found that for a given cupola there is an optimum size of coke, but the foundryman cannot control the size. P. A. Russell, S. Russell & Sons, Ltd., Bath Lane, Leicester, stated that it had been his definite experience that coke should arrive at the works in as large a size as possible, this being an indication comparable to the shatter test, which is not always easy to conduct in a foundry. A speaker pointed out that the size of the coke has an effect on the shatter test, and that small coke tends to give too high a figure. It was also stated that better results were secured in a certain foundry after the smalls had been eliminated.

During the meeting, a number of works visits were paid in and around Derby, including: Bamford's, Ltd., Uttoxeter, agricultural engineers and ironfounders; Ley's Malleable Castings Co., Ltd., the largest malleable iron foundry in Europe; Qualcast, Ltd., repetition ironfounders, automobile castings, lawnmower manufacturers; Stanton Ironworks Co., Ltd.; Herbert Morris, Ltd., Loughborough, manufacturers of cranes and all types of lifting and conveying equipment; Loughborough College, Loughborough—engineering training on actual production; extensive and well-equipped workshops, foundry and laboratories. At the annual banquet, held in the evening of Wednesday, June 9, nearly 400 guests were present.

Northern California Chapter Elects

Charles J. P. Hoehn, Enterprise Foundry Corp., San Francisco, was elected chairman of the Northern California chapter of the American Foundrymen's association at the annual meeting held June 11 at the Athens Athletic club, Oakland, Calif. John D. Fenstermacher, Columbia Steel Co., San Francisco, was elected vice chairman, and George L. Kennard was re-elected secretary-treasurer. The following were elected directors to serve for 2 years: Frank C. Holman, Ivan L. Johnson, R. E. Noack and W. A. Schimmelpfennig.

C. M. Henderson, Macaulay Foundry Co., Berkeley, Calif., retiring chairman of the chapter, was presented a gift in appreciation of his leadership of the organization during the past 18 months. The presentation was made by Mr. Hoehn. Fred DeBold, superintendent, Apex Bronze Foundry and Charles J. P. Hoehn reported on the recent Milwaukee convention of the A.F.A.

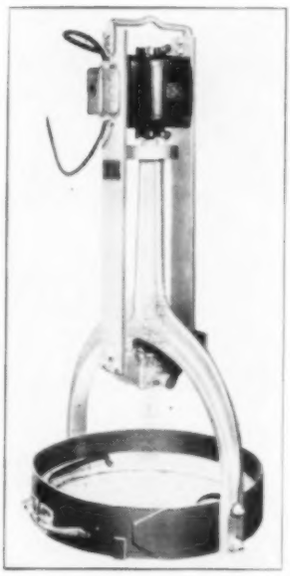
L. F. Scott, Spencer Turbine Co., presented an address on "Dust Control in Foundries." Mr. Scott stated that the fundamental condition affecting dust control is the rearrangement of various operations in isolated points which will permit the control of dust at its source. If this cannot be done, it is desirable to arrange working schedules so that dusty operations are performed after regular working hours with a minimum number of men, all of whom are protected by helmets with artificial supply of clean air. Mr. Scott then discussed the application of the industrial vacuum cleaner to the problem of dust control in foundries.

ADVERTISING PAGES REMOVED

NEW EQUIPMENT for FOUNDRIES

Electric Sifter

In redesigning the Lowe high speed electric sifter, shown in the accompanying illustration, the Federal Foundry Supply Co., Cleveland, has incorporated what are claimed to be five distinctly new and improved features. The yoke and main shaft are combined in a one-piece aluminum alloy casting eliminating all welding and bolting and giving lighter weight. A cast aluminum alloy bearing block with replaceable heavy bronze bearings now is used. The bearing block and ball socket carry the entire load. Beveled ends of the bearing block allow greater clearance for shoveling.



Power is concentrated on the sifting surface

An over size replaceable steel ball is fitted over the lower end of the main shaft. An alloy steel collar on top of the main shaft is replaceable and fits into a large ball bearing on the under side of the fly wheel. Other features of the original machine are retained and include the following: Gyro-vibratory action on the screen eliminates vibration on the frame and concentrates the power at the sifting surface; removable screen bottoms; totally enclosed 1/3-horsepower motor; control switch on frame, etc. The sifter is made in several models for sifting either liquid or dry materials.

Molding Machine

Tabor Mfg. Co., 6225 Tacony street, Philadelphia, recently has incorporated several new features in the cantilever type squeezer, shown in the accompanying illustration. In the tripod or three-point support, lines drawn from the rear control support through the two strain rods, form a triangle. Extension of these lines will pass just outside the block. Thus in squeezing, whether the concentration of the pressure on the ramming is central and uniform or at one side or the other, the entire force still is within the triangle. It is claimed this prevents any tendency to shift sideways regardless of the condition of the supporting bearings.

The ramming block may be changed to different heights by removing a single pin. The jarring unit with long, effective stroke is of the valveless type. The squeezing piston is the top squeezer made by that company turned bottom side up on which a long life is claimed for the cup leather washer on a drawn steel cylinder. By applying one of the long established principles used in the shockless jarring machine, the piston and piston rod in the new bottom squeezer becomes a jarring piston and cylinder. The piston rod forms the jarring cylinder and guide for the table. The piston rod is 4½ inches diameter and has a 13-inch guide even at the top of the squeezing stroke. Another feature is a pop throttle valve with replaceable seats.

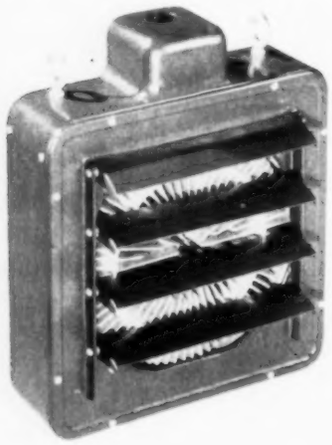
The ramming block may be changed to different heights by removing a single pin

Speed Control

Columbia Vari-Speed Co., Wheaton, Ill., has introduced a new speed transmission control. Transmission consists of a single shaft with two adjustable V-belt pulleys varying in diameter as their distances from the driving and driven pulley are changed. The unit offers infinite speed selectivity within ratios of 5 to 1. Features claimed include single shaft design, compactness, efficiency, economy, one point lubrication, etc. The unit is made in sizes from ¼ to 7½ horsepower.

Industrial Heater

Electric Air Heater Co. division of the American Foundry Equipment Co., 555 South Byrkit street, Mishawaka, Ind., has introduced a new electric industrial heater. The



Adjustable deflectors direct heated air in desired direction

source of heat is a cast aluminum grid which has been poured around a calrod element. This grid construction is said to eliminate all hot wires and dead air space, giving economical and safe operation for heating purposes.

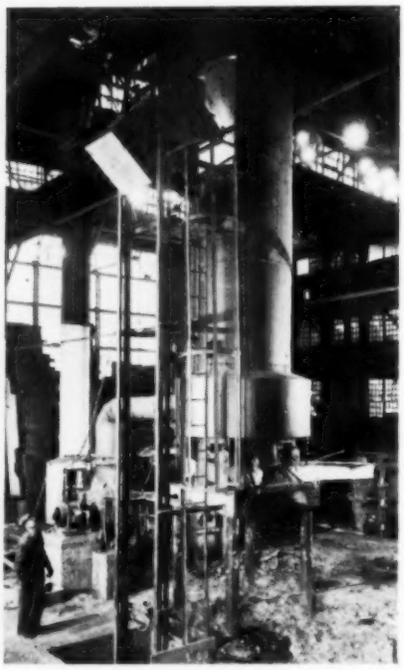
A motor driven, 4-bladed aluminum fan, running on a graphite impregnated bronze bushing for quiet operation, dissipates heat from the entire surface of the circular grid and circulates the warm air. Heat can be directed wherever it is needed by moving a series of adjustable deflectors mounted on the front of the unit. The heater may be suspended from the ceiling by eyebolts or fastened to the wall with angle braces. The heater is shown in the accompanying illustration.

Skip Hoist Charger

The Whiting Corp., Harvey, Ill., recently has developed a skip hoist type charger, shown in the accompanying illustration, which is adaptable for use with either large or small cupolas. Among the advantages claimed are elimination of a charging floor and all attendant features. The structure occupies a minimum of space and it is claimed readily can be erected in old buildings where space would not permit a more elaborate installation. For small cupolas, the device erected in vertical position, as shown in the illustration, occupies floor space less than 6 feet square.

Charges may be dumped into the bucket from wheel barrows, hand dump cars, balanced charging cars or other special loading devices. Ample space is provided between the bail and the top of the skip bucket. The bucket at low position is at floor level. It is raised and dumped by electric power. An automatic limit switch limits the travel in both upper and lower positions while an electric solenoid brake holds the load in case it is necessary to shut off the power.

Once the charge is in the bucket, the press of a button does the rest. The cycle can be timed for most efficient practice. Bucket and steel work are of substantial construction. The hoisting mechanism consisting of herringbone gears with shafts



Safety limit switch automatically controls position of bucket at top and bottom

running on roller bearings are splash lubricated in a dust tight case.

Magnetic Contactor

General Electric Co., Schenectady, N. Y., has introduced a new size 00 alternating current multipole magnetic contactor for controlling small single-phase and polyphase motors, or for use as a flexible relaying device for comprehensive control systems such as are used on machine tools. The contactor also can be supplied as a magnetic switch mounted on a small sheetmetal case which is suitable for general-purpose applications where atmospheric conditions are normal. The new alternating current magnetic contactor, when used in service either as a contactor or a magnetic switch, has a maximum rating of 10 amperes at 600 volts.

Glue Pot

General Electric Co., Schenectady, N. Y., recently has designed a new automatic gluepot which heats rapidly until it reaches 140-150 degrees Fahr. This temperature is factory set and is maintained automatically and accurately.

The gluepot consists of a removable copper container for holding the glue, a heated copper jacket in contact with the glue container, and an outer protective casing of heavy steel. It has a capacity of two quarts and is available in 115 or 230 volts, alternating current or direct current.

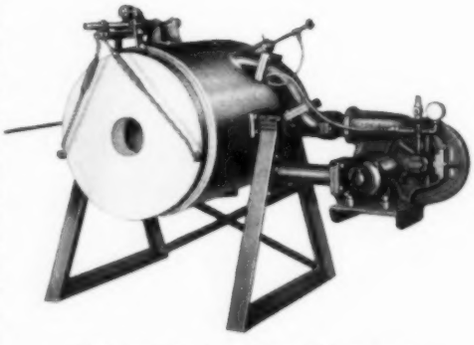
Drum Controllers

Cutler-Hammer Inc., Milwaukee, has introduced a new line of fractional horsepower drum controllers. These are used with reversible alternating current squirrel cage motors and reversing or nonreversing multispeed squirrel cage motors, driving machine tools and similar machines where speed regulation is desired.

Tilting Furnace

Campbell-Hausfeld Co., Harrison, O., recently has designed a small tilting crucible furnace for nonferrous melting. This furnace is built to accommodate a No. 60 or No. 80 standard long lip crucible. It has a capacity of 180 or 240 pounds per heat. When using a No. 60 crucible, it is claimed that a heat can be taken from the furnace every 30 minutes. With the small, tilting type furnace, the cover remains on the furnace when pouring, thus conserving the temperature that has been built up and therefore resulting in a lower fuel cost and faster melting. A view of the furnace is shown in the illustration below.

Roloff Engineering Co., 610 West Michigan street, Milwaukee, has been appointed Milwaukee sales representative for the Ajax Flexible Coupling Co., Westfield, N. Y.



The furnace is of the tilting type

Have you seen the

CLEARFIELD

VERTICAL HOIST LOADER?

Minimum head-room — minimum floor space—simpler to operate—

This loader plus the CLEARFIELD Sand Mixer makes a great sand conditioning unit. Loader capacities to suit mixer sizes.

CLEARFIELD MACHINE CO.

Clearfield, Pennsylvania

PANGBORN-NORBIDE ★

"LONG WEAR" BLAST CLEANING NOZZLES

GUARANTEED

To give 1500 HOURS SERVICE WITH THE USE OF STEEL ABRASIVES AND 750 HOURS WITH SAND. SIZES AND STYLES TO MEET ALL REQUIREMENTS.

Write us

★Trade-mark of Norton Co. for Boron Carbide

PANGBORN CORPORATION

The World's Largest Manufacturer of Blast Cleaning and Dust Collecting Equipment

HAGERSTOWN - - - - MARYLAND

OBITUARY

PETER GARTLAND, 65, president of the former Terre Haute Foundry Co. and associated with the Gartland Foundry Co., Terre Haute, Ind., died at Indianapolis recently. Mr. Gartland was born in Westport, Conn., and was sales manager of the Interstate Foundry Co., Cleveland until 1907, when he went to Terre Haute, Ind., and became associated with the Terre Haute Foundry Co. When that company expanded and established branches in Michigan, Indiana, Wisconsin and other middle western states, Mr. Gartland became a director of the holding company.

♦ ♦ ♦

Elwell L. Springer, 73, retired former assistant superintendent of the Wilmington, Del., plant of the American Car & Foundry Co., died at Wilmington on June 3.

♦ ♦ ♦

Leon W. Friedman, 66, industrial editor of the *Birmingham News*, Birmingham, Ala. for the past 30 years, and for many years correspondent for THE FOUNDRY, *Daily Metal Trade* and *Steel*, died May 31.

♦ ♦ ♦

Albert R. Sandine, 57, district sales manager for the Waltham Grinding Wheel Co., Cleveland, died recently at his home in that city. He was born in Hognas, Sweden, and had been associated with the Norton Grinding Wheel Co. for 38 years, acting as Ohio district sales manager in Cleveland for 25 years. He became associated with the Waltham company as district sales manager in 1935.

♦ ♦ ♦

Charles A. Diehl, 82, retired foreman of the molding department, National Malleable & Steel Castings Co., Cleveland, died recently in that city. Mr. Diehl was a native of New York but had lived in Cleveland for the past 61 years.

♦ ♦ ♦

Eugene A. Giard, 43, research engineer, Cutler-Hammer Inc., Milwaukee, died June 12 after a short illness. Mr. Giard was a graduate of the University of Chicago and took post graduate work at Columbia university.

♦ ♦ ♦

Robert R. Keith, 58, manager of the tractor works, J. I. Case Co., Racine, Wis. died June 13. He was widely known as a consulting engineer and was vice president of the Society of Automotive Engineers, representing production engineering.

♦ ♦ ♦

W. J. Dickinson, 59, manager of the freight car manufacturing plants, Pullman-Standard Car Mfg. Co., Chicago, died at his home in Michigan City, Ind. on May 20. He had been connected with that company for 41 years.

♦ ♦ ♦

Frank L. Uhl, 58, president, Detroit Brass & Malleable Works, Detroit, for the past decade, died June 10 after a heart attack. Mr. Uhl was born in New Washington, O., and began work with the Detroit Brass & Malleable Works 20 years ago as a salesman.

♦ ♦ ♦

Daniel Bell, 78, died June 30 at his home in Boston. The late Mr. Bell was born in Chatham, N. B. and after learning the molder's trade, went to the United States where he worked in several foundries in New York and New Jersey and was active in the affairs of the Molder's Union. In the early 90's he acted as representative of THE FOUNDRY in that district, combining the duties of correspondent, subscription and advertising agent. In 1900 he was appointed foundry foreman for the Dominion Coal Co., Glace Bay, Nova Scotia and retained that position until 1924 when he was retired under the company pension plan at the age of 65. In his early days he was a noted athlete and swimmer and until comparatively recent years enjoyed a daily dip in the ocean summer and winter. He is survived by his widow, a daughter in Washington and a son Donald G. Bell, D. M. D., in Boston.

♦ ♦ ♦

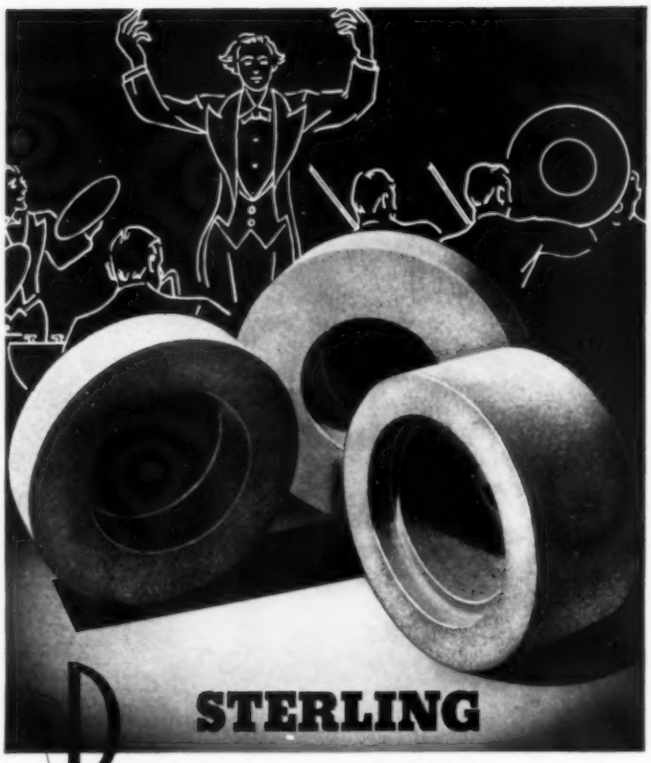
W. W. Butler, 74, president of the Canadian Car & Foundry Co., Montreal, Que., died in that city June 17. He was born in Danville, O. and was president of Canadian Steel Foundries Ltd. and the Pratt & Letchworth Co. Ltd. Before entering the Dominion, Mr. Butler served as western sales agent of the American Car & Foundry Co., vice president of the Simplex Railway Appliances Co. and of the American Steel Foundries, New York. In 1901 he went to Montreal and established the plant of the Simplex Co. and of the Dominion Steel Car Co. He was largely instrumental in organizing the Canadian Car & Foundry Co.

A corner in the Hall of Progress at the Great Lakes Exposition, Cleveland. The National Malleable Casting Co. display at the right features castings for transportation

Acid Resisting Test For Enamel

Porcelain Enamel institute, Chicago, through its technical research section, educational bureau, recently has made available a publication describing a tentative standard for determining the acid resistance of porcelain enamels. Complete instructions are given on room temperature test, boiling test, and classification of enamel frits. Copies of the bulletin which is entitled, "Test for Acid Resistance of Porcelain Enamels," may be obtained from the institute, 612 North Michigan avenue, Chicago, for 10 cents.

Accidents incurred while handling objects are chargeable with 29 per cent of all industrial cases and 17 per cent of the compensation paid.



PRECISION Centerless

Grinding Wheels built by Sterling have gained an enviable reputation for efficiency in the Country's largest industries. A reputation earned by the application of closely supervised manufacturing coupled with the expert knowledge of engineers trained to fit the wheel to the work.

Our varied experience in making these efficient Centerless wheels is at your command and we respectfully suggest you call for one of our experts who will gladly check your grinding with you . . . at no obligation to you.

THE STERLING GRINDING WHEEL CO.

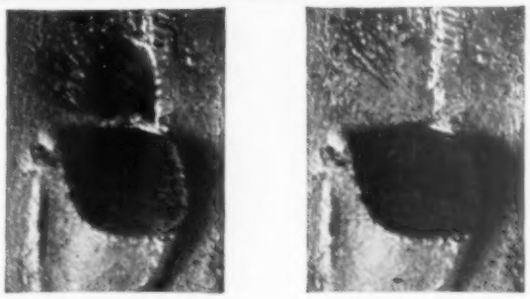
Abrasive Division of The Cleveland Quarries Co.

Factory and Office: TIFFIN, OHIO

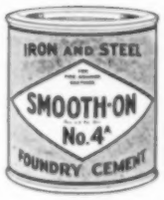
CHICAGO: 912 W. Washington Blvd. • DETROIT: 101-107 W. Warren Ave.

STERLING Abrasives

CLEVELAND STERLING TRADE MARK



Correct the holes as well as the humps!



THOSE few castings which come out of the molds with harmless but unsightly surface pits and rough depressions should always be corrected to perfect contour, and as the cost of filling is but the smallest fraction of the value of the finished casting, you can't afford to use any filling material but the best.

For this purpose, Smooth-On No. 4, like success, has no substitute. It is the one material for perfect match of texture and color, for ability to harden properly and stay put, and for ease of application. Its judicious use has saved more money for foundrymen than any other process or equipment in their plants and pays an almost fabulous return on an investment seldom exceeding a few dollars per year.

With this 30-year record for thorough satisfaction, Smooth-On No. 4 offers an opportunity from which you cannot fail to profit.

Smooth-On No. 4 is made in three compositions, to offer a choice of color, lustre and texture for any iron or steel casting. Correct selection and application produces a filling which cannot be detected.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish.

Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre.

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade.

FREE
HARDENED and WORKING
SAMPLES

Smooth-On Nos. 4AA, 4A and 4B are packed in 1-lb. and 5-lb. can, 25-lb pail or 100-lb. keg. Mail coupon for prices and free hardened and working samples.

Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N. J.

Please send *working* samples of
Smooth-On ☐ No. 4AA
Smooth-On ☐ No. 4A
Smooth-On ☐ No. 4B
☐ Hardened samples of all three.

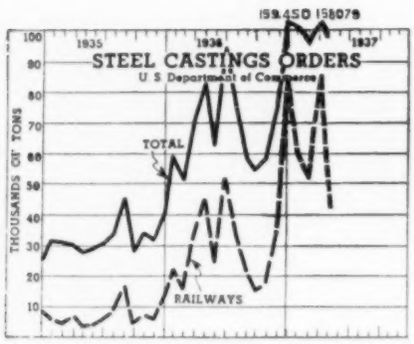
Name.....

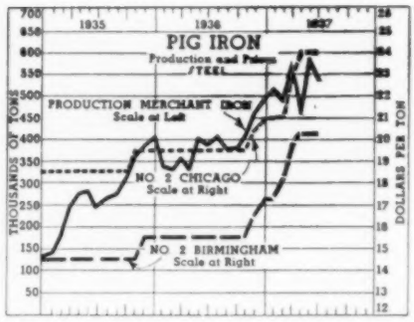
Address.....

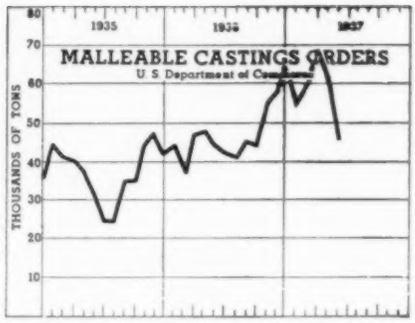
.....

7-37

Do it with **SMOOTH-ON**







FOUNDRY ACTIVITIES

INDUSTRIAL Steel Casting Co., maker of carbon steel castings, and Wine Railway Appliance Co., manufacturer of devices and equipment for railway cars, both of Toledo, O., have been consolidated to form the Unitcast Corp., according to an announcement made by company officials. At present, the Industrial Steel Casting Co. is engaged in an expansion program to cost approximately $100,000. Officers of the Unitcast Corp. are William E. Wine, chairman of the board; Ralph F. Tillman, president; L. J. Tillman, Joseph L. Tillman Jr. and Cyrus Hankins, vice presidents; and H. W. Morgan, secretary.

* * *

Hoban Brass Foundry, Dayton, O., recently was destroyed by fire.

* * *

Kankakee Foundry Co., Kankakee, Ill., is constructing a $30,000 addition to its molding department.

* * *

Pontiac Motor Co., Pontiac, Mich., will build a $33,000 foundry addition. Austin Co., Detroit, is the contractor.

* * *

Fargo Foundry Co., Fargo, N. D., held an open house June 19 and invited the public to examine its modern new office building which is equipped with the latest in air-conditioning and air cleansing systems. Established in 1912 with 15 men, the foundry now employes 110 persons and in addition to a general foundry business manufactures oil burners, welding equipment, smokestacks, etc.

RAW MATERIAL PRICES

July 6, 1937

Iron	
No. 2 foundry, Valley	$24.00
No. 2 Southern Birmingham	20.00
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	23.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$ 6.00 to $ 6.50
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.10
Scrap	
Heavy melting steel, Valley	$18.25 to $18.50
Heavy melting steel, Pitts. (Ilv.)	18.00 to 18.50
Heavy melting steel, Chicago	15.50 to 16.00
Stove plate, Buffalo	14.50 to 15.00
Stove plate, Chicago	10.50 to 11.00
No. 1 cast, New York	14.50 to 15.00
No. 1 cast, mchy., Chicago	14.50 to 15.00
No. 1 cast, Pittsburgh	18.50 to 19.00
No. 1 cast, Philadelphia	19.00 to 19.50
No. 1 cast, Birmingham	14.50 to 15.00
Car wheels, iron, Pittsburgh	19.50 to 19.75
Car wheels, iron, Chicago	18.00 to 18.50
Railroad malleable, Chicago	18.50 to 19.00
Malleable, Buffalo	20.00 to 21.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	13.75
Straights tin	59.25
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	18.50 to 19.00
Lead, New York	6.00
Antimony, New York	14.12½
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	6.75

Index of foundry equipment orders for May, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 237.6 as compared with 208.1 for April and 165.1 for May, 1936. Index of shipments was 226.2 as compared with 232.5 for April and 146.7 for May of the previous year.

* * *

Metal & Alloy Specialties Co., Buffalo, is constructing an addition to its foundry on Elmwood avenue.

* * *

John Westwick & Son Inc., Claude street, Milwaukee, has begun construction of a steel addition to its foundry.

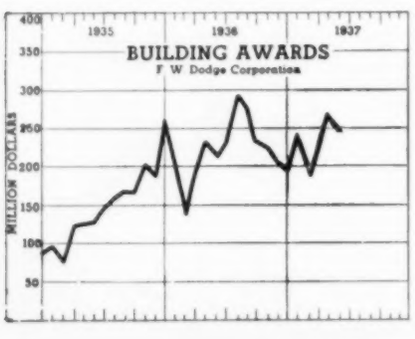
* * *

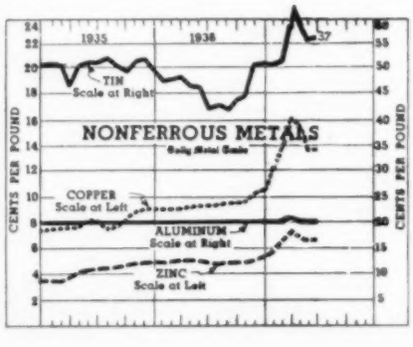
Western Alloyed Steel Casting Co., 2833 Grand avenue, Minneapolis, is constructing a one-story pattern building to be 50 x 52 feet.

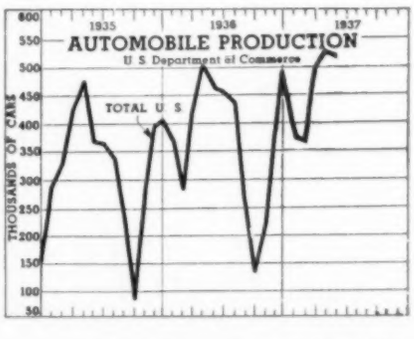
* * *

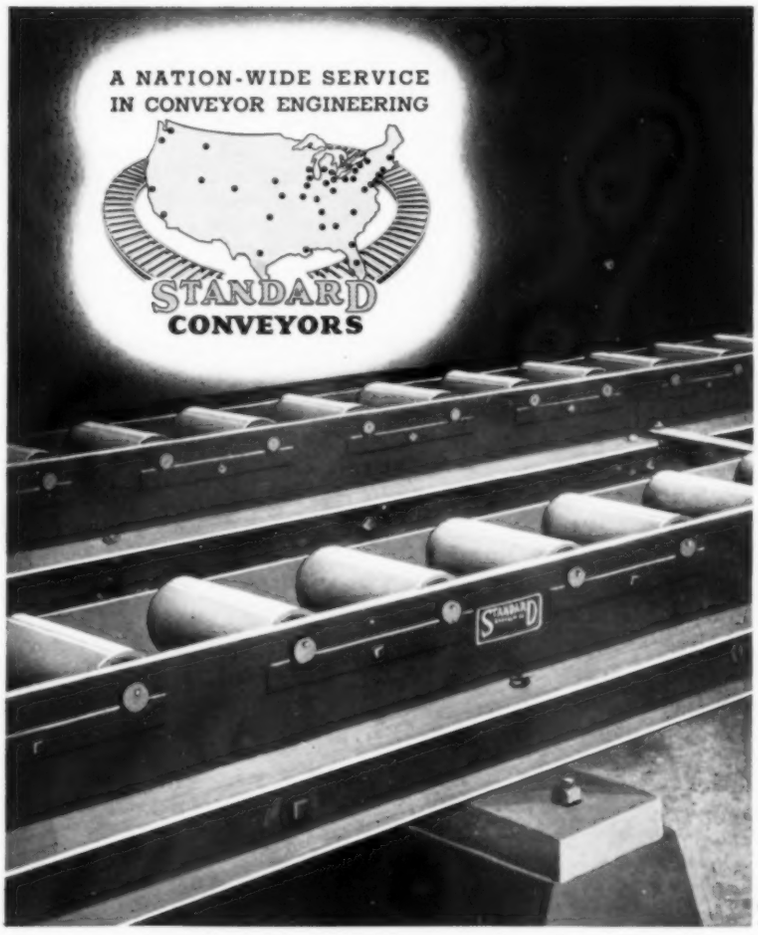
General Foundries Co., 2570 North Thirty-second street, Milwaukee, which recently purchased the 180 x 200 foot gray iron shop of the old

(*Continued on page* 96)









STANDARD'S PROTECTED BEARINGS

Are Vital to Foundry Conveyors

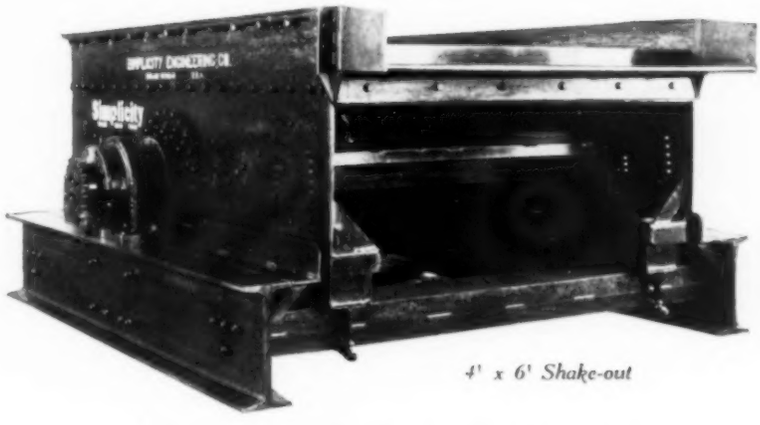
Every Standard Roller Conveyor is equipped with specially designed bearings . . . grease-sealed to reduce wear, retard rust and guard against the entrance of dust, sand and grit. Steel shields protect bearings against metal spillage.

Your foundry—every foundry—has its individual and different conveying problems. Standard engineers — with years of specialized foundry experience—will assist you in finding the right conveyors for your needs. Write for bulletin F-7 "Conveyors by Standard for Steel Mill and Foundry."

STANDARD CONVEYOR COMPANY

General Offices:
NORTH ST. PAUL, MINN.

Simplicity
FOUNDRY EQUIPMENT



4' x 6' Shake-out

That tough shake-out job is the ideal spot to use a Simplicity. Reduce your costs by faster cleaning of flasks and castings, no matter if you have dry sand or green sand molds. Important savings in flask wear, cleaner castings, better working conditions, and 100% service are additional reasons for the rapid increase in the number of Simplicity Shake-outs in use in both Production and Jobbing Foundries today.

"Recommendations Based on Experience Guarantee Proper Service"

Simplicity Engineering Company

DURAND, MICHIGAN

For Canada: Waterous Limited, Brantford, Ontario

(*Contiued from page* 94)

Fuller-Warren Co., stove and range manufacturer, and an adjacent building of similar dimensions, is fitting the latter as a pattern and carpenter shop and cleaning room according to Fred Busche, president of the firm.

* * *

Buckeye Iron & Brass Works, 326 East Third street, Dayton, O., recently was damaged by fire.

* * *

Detroit Steel Casting Co., Detroit, will erect a $10,000 office building on Michigan avenue. J. A. Utley Co. has been awarded the contract.

* * *

Herzberg & Byron Inc., Saginaw, Mich., has been organized by Charles F. Byron, 2215 James street, to conduct a general foundry business.

* * *

Wilson Foundry & Machine Co., Pontiac, Mich., will build a two-story office building, 40 x 100 feet, on South Saginaw street. L. J. Heenan is architect.

* * *

Petroleum Car & Foundry Co., Quindara boulevard, Kansas City, Kans., recently was destroyed by fire. Loss on the building and foundry equipment amounted to $10,000.

* * *

Monroe Steel Castings Co., Monroe, Mich. has awarded the general contract for an addition to its machine and carpenter shops to Bennage & McKinstrie Co., Detroit.

* * *

Missouri-Central Type Foundry, 705 East Murdock avenue, Wichita, Kans., is building a 25 x 80 foot addition to its plant and is remodeling the original factory building.

* * *

The Berry Iron & Steel Co., St. Joseph, Mo., one of the oldest foundries in that section, having been founded in 1894, was purchased by the Locomotive Finished Material Co. of Atchison, Kans.

* * *

Paxton-Mitchell Co., Omaha, Nebr., is planning a 70 x 70 foot, three-story brick addition to its foundry at 2614 Martha street. Total cost of building and equipment will be about $35,000.

* * *

Oil City Brass Works, Beaumont, Tex., will rebuild its burned pattern department and install a new electrical system at its plant at 326 Neches street, according to George E. Bryant Sr., president of the company.

* * *

Standard Stoker Co., 1701 Gaskill avenue, Erie, Pa., is taking bids for the erection of a steel foundry to cost approximately $100,000.

* * *

Fuller-Warren Co., Muncie, Ind., is planning to remodel its factory to include a foundry and an enameling department. Total cost is expected to be approximately $40,000 with new equipment.

* * *

The new plant of the Bremen Aluminum & Brass Products Corp., Bremen, Ind., was opened officially on Friday, June 4, with an open house and an invitation to the public to visit the factory and see it in actual operation. Officers of the corporation are O. E. Mutti, president; Carl Haab, vice president; Mr. Newell, treasurer; Mr. Fritz, secretary; and Roscoe L. Egger as the fifth member of the board of directors.

* * *

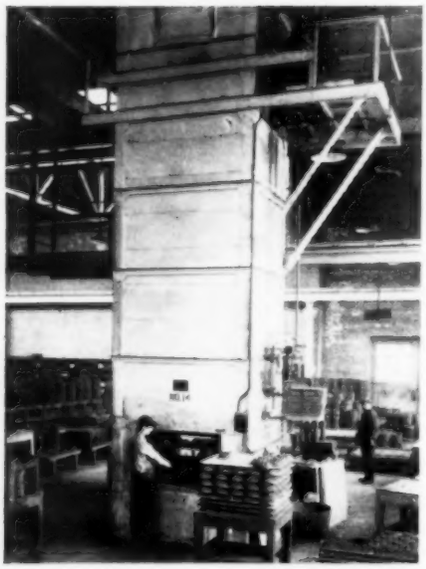
Patterson Foundry & Machine Co., East Liverpool, O., has begun an expansion program which is expected to double its production facilities within the next two years. As an initial step, additions to the machine and fabricating divisions have increased the capacity of those departments approximately 50 per cent, while construction of a new tunnel kiln at the Porox division will increase the capacity of that department in the production of lining blocks and grinding balls.

* * *

American Seating Co., 901 Broadway avenue, Grand Rapids, Mich., has awarded contract to Owen, Ames

(*Concluded on page* 98)

★ ★ DSM ★ ★



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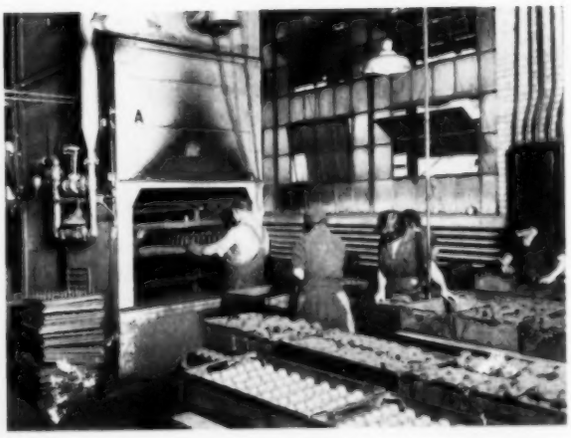

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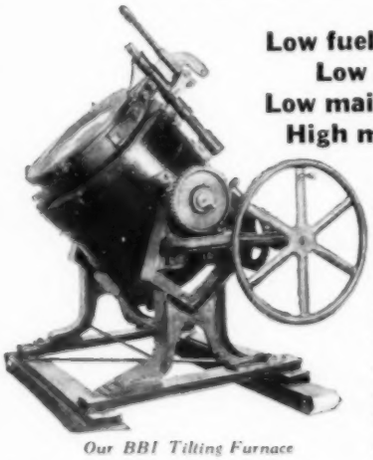

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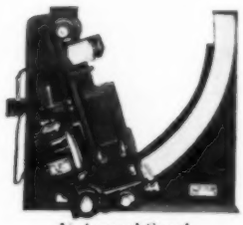

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(*Concluded from page* 96)

& Kimball, Grand Rapids, for construction of a $20,000 addition to its factory.

* * *

Columbus Casting Co., Olentangy River road, Columbus, O., manufacturer of iron castings, plans a one-story L-shaped foundry, 72 x 135 feet, to cost approximately $50,000 with equipment.

* * *

Star Pattern Model Works Inc., 726 Sixth street, Rockford, Ill., has been incorporated to manufacture wood and metal patterns, by V. Olson, H. Hasselroth and E. Olson. Carroll H. Nelson, 304 Reliance building, is correspondent.

* * *

New plant of the Campbell, Wyant & Cannon Foundry Co., in conjunction with the Motor Wheel Corp., at Lansing, Mich., has begun operations. The completed plant is said to cost approximately $750,000 and is mechanized for the production of centrifugally lined and fused brake drums.

* * *

Equipment of the Baker-Nagle Foundry Co., Belleville, Ill., has been sold and the plant dismantled. The A. G. Brauer Supply Co., St. Louis, has purchased the patterns and will furnish repairs for all stoves formerly made by the Baker-Nagle company.

* * *

McKenna Brass & Mfg. Corp., Pittsburgh, successor to McKenna Brass & Mfg. Co. Inc., is now located in its new plant at Dallas and Susquehanna streets, for the manufacture of bottling machinery, bottle washers, carbonaters, filters and a general line of brass goods.

* * *

Klaene & Kruckemeyer Foundry & Engineering Co. Inc., 103 Russell street, Covington, Ky., recently has been organized to operate a jobbing gray iron shop. R. L. Kruckemeyer is president; L. Klaene, vice president; F. Klaene, treasurer, and A. L. Kruckemeyer, secretary.

* * *

Activity of gray iron and steel foundries in the Philadelphia Federal Reserve district declined during May according to reports received by the Industrial Research department of the University of Pennsylvania. Output of gray iron castings decreased 9.3 per cent from that of the previous month. In general, however, production in May was 51.2 per cent higher than in the same month last year. Production of steel castings during May was 19.0 per cent less than that of the previous month, but retained a lead of 8.4 per cent over the same month a year ago.

NEW TRADE PUBLICATIONS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

DUST COLLECTORS—Pangborn Corp., Hagerstown, Md., gives four case examples in a recent bulletin, to point out features of its dust collection system.

RECORDERS, CONTROLLERS—Bristol Co., Waterbury, Conn., has published an 8-Page bulletin on its new line of low range pressure and draft recorders and controllers.

LIFT TRUCK PLATFORMS—Lewis-Shepard Co., 267 Walnut street, Watertown, Mass., has sent out a small colored folder on its skid platform for lift trucks. Illustrations and 10 features of construction are given.

ELECTRIC HEATING—General Electric Co., Schenectady, N. Y., lists numerous small heating units of all kinds and for a multitude of tasks in an attractive publication. Illustrations and description cover 59 pages.

CARBIDE TOOLS—Norton Co., Worcester, Mass., has developed an attractive booklet on grinding cemented carbide tools. Crystalon and diamond wheels are treated in a sectional way, giving grinding procedure, wheel recommendations, special tools, etc.

TRANSMISSION BELTS—United States Rubber Co., Passaic, N. J., has prepared a novel publication carrying the title of "An Album of Familiar Belts." Within are enclosed, in photograph form, data on the company's belts at work and in the making.

PYROMETERS — Brown Instrument Co., Philadelphia, shows the 8 features of its recording pyrometers, millivoltmeter type through a large folder. How to choose the units and what they can do is presented in descriptive form. Single and multiple recording pyrometers, high resisting and flush type indicating units, etc., are fully illustrated.

MICROSCOPES—Brausch & Lomb Optical Co., Rochester, N. Y., gives general mechanical features, models and accessories of its laboratory microscopes in a publication containing many illustrations. Another single page bulletin gives supplementary attachments and accessories for the company's polaroid micro units.

ROLLING DOORS—Cornell Iron Works Inc., Thirty-sixth avenue and Thirteenth street, Long Island City, N. Y., has presented information in its new general catalog on upward acting doors for commercial and domestic use. General description, use and operation are given. Its line of rolling grilles also is described.

WELDERS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has prepared a booklet on its engine driven welders, single operator, 200-300-400 ampere sets. Performance curves of the welder, fuel consumption curves of the engines and general description of the welders and power units are made available.

SUSPENDED MAGNETS—Stearns Magnetic Mfg. Co., Milwaukee, specifies its various types of safety suspended circular, rectangular and hand magnets together with illustrations, description and application data, in a recent bulletin. The company has issued another bulletin on its magnetically operated brake, floor or motor mounted through a keyed shaft, geared directly to the operating elements of the brakes.

FLUX—Mathieson Alkali Works, 60 East Forty-second street, New York, recently has issued a new folder on the use of Purite in the cupola and ladle. It describes the action of this flux in producing cleaner castings from cupola melted metal.

BINDERS—Hercules Powder Co., Wilmington, Del., has described in a recent booklet the manner in which its laboratory facilities are being utilized for the research and development of the company's powdered dry bond binder. Illustrations are clear and description of the phases in experimental work is simple.

CONVEYORS—Logan Co. Inc., Louisville, Ky., has gathered information under the title "Conveyors for the Foundry" and with the use of numerous illustrations and diagrams has presented several layouts of conveyor systems. Details of construction and other features of the conveyors are amply described.

CRANE TRUCKS—Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland, has published a bulletin describing its four types of portable crane trucks, ranging in capacity from 1000 to 10,000 pounds. Each has a two-wheel drive and a four-wheel steer by means of a wheel. Bulletin shows varied uses for the units with their specifications.

CONTROLLERS—Foxboro Co., Foxboro, Mass., has publicized its line of controllers in an illustrated booklet entitled "Air Weight Control." Explained in detail are such features as flow record, automatic full floating control and compensating mechanism which resets the controller to take care of variations in atmospheric temperatures and barometric pressures.

TESTING SIEVE SHAKERS—Newark Wire Cloth Co., 351 Verona avenue, Newark, N. J., has provided information in a small folder on its new testing sieve shaker. Data is given on how the machine imitates hand testing. In addition, considerable material is presented on features of the company's testing sieves, how they are graduated, with a table of sizes.

MAINTENANCE PRODUCTS — Skybryte Co., 3125 Perkins avenue, Cleveland, has prepared a catalog devoted to its maintenance products for concrete, metal, wood, glass and composition surfaces. Aluminum paint and enamel, heat resisting aluminum and black paint, rust paint and covering, factory glass cleaner and numerous other products of the company are described and illustrated as to use.

GAS INDICATOR—Mine Safety Appliance Co., Braddock, Thomas and Meade avenues, Pittsburgh, recently issued a bulletin describing its combustible gas indicator, a self-contained, portable instrument used for testing explosive gas hazards and locating leaking gas. The brochure is complete with photographic illustrations and an operating diagram together with examples of how and where the instrument is being used effectively.